THE BEHAVIOR OF MONEY

PREPARED UNDER THE AUSPICES OF
THE COLUMBIA UNIVERSITY COUNCIL FOR RESEARCH IN
THE SOCIAL SCIENCES

THE BEHAVIOR OF MONEY

Exploratory Studies

BY

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FIRST EDITION

McGRAW-HILL BOOK COMPANY, INC.

NEW YORK AND LONDON

1936

THE MAPLE PRESS COMPANY, YORK, PA.

To the memory of

MY MOTHER

WHO FIRST INTERESTED ME IN
THE STUDY OF ECONOMICS

Preface

ALMOST no problem of today, and certainly no problem of economic life, has been more widely and more vehemently debated in the United States during the past two or three years than the problem of money. Nothing else in the economic sphere has had so nearly universal and at times such profound effects as the recent wide changes in the quantity and the character of our money supply, and nothing else has evoked such floods of proposals for control. Yet our actual knowledge of the facts about the money supply, about how it behaves under various conditions, and more particularly about *why* it behaves as it does, is remarkably limited in a number of important directions. In certain parts of the field, there are impressive collections of statistical and other descriptive material, and impressive structures of theory. But at present there is nothing approaching an adequate body of systematic knowledge as to what the facts as a whole really are. It is surely idle, and probably dangerous, to attempt to control anything as vast and powerful as the national supply of money without knowing a good deal about its character, about the things that make it vary in quantity and composition, and about its relations with other major factors in our economic life. As well attempt to control Niagara, without a knowledge of engineering.

The present volume is an endeavor to increase the supply of facts about money. It is therefore addressed to all who deal with the fundamental problems of money and banking, whether as bankers, as statesmen, or as academic students, and to all others who must gauge the significance of current monetary and banking phenomena. It is not a systematic

treatise, and it does not pretend to give complete answers to every question raised. Its several chapters, however, all deal with various aspects of the recent actual behavior of our money supply. They are concerned in part with the internal behavior of the quantity and velocity of circulation of the money supply itself—with its trends, seasonal patterns, amplitudes of fluctuation, and the like; and in part with the relations between the money supply and such things as prices, car loadings, industrial production, national income, gold movements, and security transactions. Although the results obtained have been restricted by the limitations of the materials easily available, and also by the exploratory character of the methods employed, it is hoped that these results will be useful both in the construction of general theoretical analyses and in the formulation of intelligent practical programs for monetary control.

The investigations on which the volume rests were conducted under the auspices of the Columbia University Council for Research in the Social Sciences. I am warmly grateful to the Council for its assistance. My appreciation is the keener, because without help of this kind the individual worker is almost completely debarred from attempting studies of the detailed and laborious sort here described.

The collection and analysis of the underlying statistics were carried on over several years, and with the collaboration of several assistants. Mrs. Ruth Prince Mack did the preliminary work for the chapter on the currency-deposit relation, Mr. E. A. Gilmore, Jr., the largest part of the work on interregional comparisons, and Mr. R. J. Saulnier all of the work on exchange velocities proper. Dr. Caroline Whitney conducted the later stages of the first two investigations, prepared the comparative material used in all three, and collected a good deal of the material presented in the smaller investigations at the end of the volume; she has borne the largest single share of the statistical burden. Mr. P. B.

Nortman helped in the later stages of the computing and checking work, and in preparing the manuscript for the printer. It is a pleasure to declare my obligation to this unusual group of assistants, not merely for technical effort and skill but also for most helpful interpretations of the data.

I am indebted for information and advice on various points to Professor Harold Hotelling; to the Columbia University Statistical Bureau; to Mr. H. V. Roelse, of the New York Federal Reserve Bank; and to the Division of Research and Statistics of the Federal Reserve Board. I owe thanks both to Professor Wesley C. Mitchell and to my wife for reading the manuscript and for a number of helpful comments. The charts were prepared by Mr. A. W. Naegels.

JAMES W. ANGELL.

NEW YORK,
April, 1936.

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Chapter I

INTRODUCTION

I. THE CHARACTER AND PURPOSE OF THESE STUDIES

THE studies presented in this volume deal with a number of important aspects of the behavior of the total supply of money of the United States.

The study which constitutes Chapter II first examines the relation of the stock of currency to the volume of bank deposits in the period since 1890, and then examines the relation of both currency and deposits to such major factors in general economic activity as industrial production, freight-car loadings, factory pay rolls, wholesale and retail prices, and security transactions. One particularly significant conclusion reached in this chapter is that currency and deposits apparently move with or after, but not before, the several measures of general economic activity just listed, and that deposits show no close connection at all with prices. These facts have an obvious bearing on current proposals for inflation, reflation, and the like. Chapter III deals with deposits on a regional instead of a national basis, describes certain aspects of the changes in the relative banking importance of the several Federal Reserve districts since 1919, and endeavors to account for these changes. It also considers certain other problems of interregional banking relations. Chapter IV investigates, to the extent permitted by the data, the exchange or turnover velocity of money; and also investigates the relation of this exchange velocity to other major factors in economic activity. It is especially striking in the latter connection that at various critical times exchange velocity was apparently associated chiefly with

fluctuations in the volume of security transactions and the like, rather than with industrial production, car loadings, or other measures of "real" or nonfinancial activity. Chapter V examines the statistical character and the apparent general economic significance of a different type of velocity of money, its "circular" velocity. The concluding Chapter VI ventures certain broader inferences, drawn from the statistical investigations, on problems of general monetary policy and control.

These studies are essentially exploratory in character. No one of them rests on a complete utilization of all the material that is available in each given area, since such a complete utilization would have enormously increased the size of the studies and the labor involved, and none of them attempts to reach definitive conclusions of large scope. Moreover, as is evident from the above outline of their contents, the studies make no pretense of providing a comprehensive and systematic survey of the whole range of problems involved. They possess, however, a fundamental unity of general subject and of method. They all lie in the broad field of investigation which is coming to be known as monetary economics. This field is developing from an attempt to combine the relevant parts of general economic theory, business-cycle analysis, and international trade theory with the larger portion of what college curricula usually refer to as "money and banking." It endeavors to describe and interpret monetary institutions, habits, operations, and relations, both in themselves and as part of the broad pattern of general economic activity, and to reach useful conclusions on questions of monetary policy in the light of the general welfare.[1] The present studies in this field, as already remarked, are chiefly concerned with various aspects of the behavior of the supply of money itself and

[1] It follows that the student of monetary economics is compelled to use the term "monetary" in the widest sense that the available facts permit in each particular case. Any narrower definition of the field would be self-defeating.

with the relations of this behavior to other major economic phenomena. At a number of points, however, the data examined also permit preliminary conclusions to be drawn with respect to current problems of policy and with respect to some of the current proposals for monetary control. Despite the obvious limitations of the studies in point of scope and definitiveness, limitations that are inherent both in the nature of the problems selected and in the restrictions which the available time and resources have placed on the methods employed, it is believed that the results obtained are of substantial significance.

The studies have a second link in the common purpose that runs through them all. Even at the present day, the great bulk of monetary theory offers an impressive superstructure of deductive reasoning, but on examination proves to rest on a remarkably narrow base of facts established by systematic empirical analysis. Monetary theorists, like many of those who have drafted the proposals for "inflation," "reflation," and other types of monetary "control" now being urged by powerful political groups, have all too often accepted rather uncritically the generalizations offered by "common sense" or "general observation," or suggested by the practical operations and rules of thumb of business men and bankers, or derived from a rather hasty perusal of the available statistics—statistics which until recent years have themselves been seriously limited. With these generalizations in hand, the theorists have forthwith embarked on the construction of more or less elaborate speculative edifices, which all too frequently have had an inadequate demonstrable relation to observed reality. No apology need be made for these constructions, for without the frequent exercise of exuberant imagination, knowledge would progress but slowly. Equally truly, however, there can be no excuse for failing to check the premises and the constructions of theory meticulously against such empirical evidence as may

be available, or for failing to alter or to extend these theoretical constructions in the light of the progressively better foundation material that successive surveys of the growing body of empirical evidence are likely to provide. Sometimes the alteration of the foundations will alter the superstructure too, sometimes not, but in either event the defensibility and the usefulness of the superstructure itself will be enhanced.[1]

The present volume undertakes, so far as the data utilized permit, to make such a check of some of the common premises of monetary theory and of some of the current political and more seriously scientific proposals for monetary control. It also attempts to provide a certain amount of additional material that can be used, positively or negatively as the case may be, in building the more general structures of theory. This additional foundation material is to be found particularly in the exploratory comparisons between monetary factors and other broad magnitudes in economic life—income, production, prices, and the like. For whatever reason, monetary economists have hitherto made rather little use of systematic empirical comparisons of this sort in drafting their general theories. In undertaking such comparisons with reference to the problems of monetary theory, the present studies can therefore make some claim to break new ground.

A word should be added as to the statistical and graphic methods used here. Because of the exploratory character of

[1] Compare the striking passage, in perhaps slightly different vein, in Professor Emil Lederer's review of Professor Clark's "Strategic Factors in Business Cycles"; the review was published in *Social Research*, May, 1934. Empirical study also plays an important part, of course, in locating and defining the unit concepts of theory.

Economists seem to have been peculiarly prone to feel that there is a fundamental dichotomy between "facts" and "theory," that they may choose one or the other as the banner under which they will serve but that they cannot serve both. This is, of course, absurd. Consciously or unconsciously, they all work under both standards. "Facts" are useless without some sort of "theory" to interpret their meaning and around which to organize them; theories are sterile without systematically organized facts in which to clothe them. It should be unnecessary to defend these truisms. Compare Professor Wesley C. Mitchell's comments in "Business Cycles: The Problem and Its Setting" (1927), pp. 189, 190.

these investigations themselves, and because of the degree of estimate involved in some of the series used, little attempt has been made to utilize the more elaborate types of statistical analysis. Trends, indices of seasonal variation, and residual "cycle-accidental" components have been computed for a number of the series when they could not be copied from other sources, but that is all. Similarly, for these and other reasons no correlation coefficients have been calculated. The chief vehicle used to present the material—as seems defensible in exploratory studies—is fairly simple charts, accompanied by a minimum amount of verbal interpretation. In large degree, the charts tell their own story.

Nearly all the charts are drawn on natural scales. The natural scale misrepresents the relative amplitudes of fluctuation, of course, but in many cases the amplitudes of two curves which it is desired to compare are so dissimilar that on logarithmic scales it would be difficult to plot clearly and to examine one of the two sets of fluctuations. Natural-scale charts are also, of course, much easier to prepare. The natural scales have usually been so selected as to give the curves that are compared roughly the same *visual* amplitudes on the charts. This represents a choice between two alternatives, neither of which is satisfactory for all purposes. Where expedient, the scales of different curves on the same chart have also been made approximate multiples of one another, to maintain rough comparability in the relative fluctuations of the several curves. The reader is urged, however, to read the scales of the charts carefully. Otherwise he is likely to misinterpret seriously the absolute levels and the fluctuations of the curves themselves.

II. THE DEFINITION OF MONEY

To clear the ground somewhat, it will be well to explain at the outset what is meant in these pages by "money."

Broadly speaking, we shall define money in terms of the supply of those things, whether physical objects or claims, which are held by the general public and which are ordinarily accepted as media of exchange in the uses to which they are ordinarily put. This, however, is rather loose, and does not help a great deal in handling the available statistics. Can we get something more concise?

It is immediately evident that the concept of money is easier to talk about, and even to use, than to define with any great accuracy. Particularly is this true when attempts are made to define money in terms of the existing available statistics or in terms of actual monetary operations. Some students have confined the designation "money" to currency in circulation, or even to legal-tender currency alone. Others, going to the opposite extreme, have extended it in principle to include all media of exchange of every conceivable type. The first definition is obviously too narrow to be very fruitful when applied to countries such as Great Britain and the United States, since in such countries much the largest component of the media of exchange in actual use is bank deposits. The second definition is not entirely practicable statistically, since little information is available currently on the volume of book credit, trade bills, and the like which are outstanding at any one time.

The characteristics other than its being a medium of exchange, which are commonly assigned to money in text-book discussions, also fail to provide a wholly satisfactory basis on which to erect a working definition. For example, many things beside those ordinarily described loosely as "money" serve on occasion as measures of value, as standards of deferred payments, and as stores of value; witness the commodity contracts and commodity hoarding which are likely to attend any period of monetary uncertainty. Even if we focus attention on money's function as a medium of exchange alone, and for practical purposes define it in

terms of currency and bank deposits, problems still remain concerning the logical treatment of time and savings deposits, of currency in bank vaults, of bankers' balances, and of various other deposit categories. Are these things to be counted as money, or are they not? The answer clearly depends in some measure on the particular purposes in view, and cannot be governed solely by a priori logical considerations. Moreover, if any large category is excluded, some other general caption must be set up to cover the omitted items, and such a procedure is usually awkward.

Difficulties of this sort are common whenever the pure theorist attempts to clothe his logical categories and processes in materials drawn from empirical observation and description. They are also common whenever the collector of empirical data attempts to fit his data into such structures as theory may have provided. A series of compromises may then become necessary. Something of logical consistency and neatness may have to be sacrificed, if contact is to be maintained with what appears at the time to be "reality"; and the taking of certain liberties with the empirical material may have to be endured, at least temporarily, if this material is to be embodied in what appears at the time to be a "rational" framework of ideas. With the advance of knowledge, however, as successive hypotheses are tested, rejected, and replaced by others currently thought more satisfactory, the gap between theoretical constructions and the form of the empirical material may be expected to diminish; the violence that must be done to each, if they are to be brought into the same universe of thought, may be expected to become less severe.

In dealing with the definition of money, compromises of similar sorts are necessary if the definition set up is to be useful in terms of the existing statistics. The first compromise consists in excluding everything except currency and bank deposits from the definition of money adopted for working

purposes, simply because of the lack of usable information on the volume of the other types of media of exchange and their variations. Presumably the items thus excluded are in any event of rather small relative importance.[1] A further problem, concerning the treatment of time and savings deposits, cannot be dismissed so easily. Demand deposits which turn over rapidly are evidently closely akin to currency in circulation (other than currency that is hoarded). But demand deposits which are in effect held idle for substantial periods—for example, the minimum balances which many banks require to be kept on deposit, or the average proportion of loan proceeds which they similarly require to be left unused—are in many important respects more closely akin to time deposits. On divers occasions, also, time deposits have been used directly to make payments without prior conversion into demand deposits or currency. Many time deposits, in turn, are essentially savings deposits, not merely temporarily idle business or individual funds. Between currency in active circulation at one extreme and savings deposits at the other, there is hence no sharp distinction that is unmistakably manifest in the available statistics or in those operations that involve money; rather, there is a series of blurred gradations, which are much less clear in the empirical material than they are in a priori logic. Where can the line reasonably be drawn between that which is "money" and that which is not?

For the purposes of the present studies, a single solution of this problem is not necessary. Instead, we shall in a sense evade the problem itself by setting up not one definition of

[1] The leading category here is book credits. In the main, it does not appear that book credits are cleared directly against one another; rather, they are eventually paid off in currency or deposits. Hence changes in book credits are presumably reflected, with a lag, in currency and deposits. The quantity of such credits, also, is presumably *relatively* small. It must be stressed, however, that these propositions are merely speculative inferences; the available data do not allow them to be tested adequately.

"money" but three, leaving the choice between them to depend on the particular purposes subsequently in view. These three categories of money we designate as "total money," "circulating money," and "active money."

"Total money" is the total supply of those things, whether physical objects or claims, which are held by the general public and which are ordinarily accepted as media of exchange in the uses to which they are ordinarily put, plus the total supply of those things which can be converted into *additional* media of exchange of the above sorts without any new contract or act of sale. This double-barrelled definition excludes currency in bank vaults, bankers' balances, exchanges, and all other physical objects or claims held by the money-creating bodies themselves. The second part of the definition includes time and savings deposits in "money," but excludes all other types of currently existing obligations—since these last must be paid off either with existing supplies of money or with new money created after a new contract or act of sale. In terms of the existing statistics, "total money" is therefore roughly the sum of currency in circulation outside all banks and the Treasury, which we shall designate briefly as "outside currency,"[1] and all demand, savings, and time deposits, after deduction of bankers' balances, exchanges, and various other duplications. A more detailed statistical definition will be given later.

"Circulating money," as the term implies, is that part of the stock of "total money" which can *itself* be used to make current payments, without conversion into anything else.

[1] "Currency" itself may be defined as any physical object which serves as money and which passes from hand to hand without endorsement. Since the term "currency in circulation" is used in the American statistics to cover all currency not held in the Treasury, whether in bank or not, some term such as "outside currency" is also needed to describe currency in circulation outside the Treasury *and* all banks. We shall here avoid as far as possible the term "cash," since this is commonly used to cover both currency and demand deposits.

This definition evidently excludes all or nearly all time and savings deposits. Roughly, "circulating money" therefore consists of outside currency plus deposits subject to check, after deduction of duplications. It is true that time deposits are sometimes also used to make payments directly, without prior conversion into demand deposits or currency. Hence strict logic would require the inclusion of some fraction of time deposits with "circulating money." Since no information is available on the size of this fraction, however, and since it is presumably small in any event, the inclusion will not be attempted here.

"Active money" is that part of the stock of "circulating money" which is *not* being currently hoarded or otherwise kept idle by the current holder, but which is itself being used currently to make current payments. This latter definition, however, should not be taken to restrict "active money" to that relatively small part of the stock of money which chances to be changing hands at any one instant. Such a restriction would be too narrow to be useful. Rather, the definition must run in terms of income and expenditure habits. Put somewhat loosely, "active money" is that part of the stock of money which is spent at an interval after its receipt not greater than what is for the holder—whether an individual or a business enterprise—one customary income-expenditure period. The size of this part of the money stock cannot be measured directly, and in consequence little reference to the concept of "active money" will be made in the present studies. It constitutes the only part, however, which at any one time is really being used to carry the current flow of exchanges.

These various definitions of money all exclude media of exchange other than currency and bank deposits—not for logical reasons, but because of the lack of information. They also exclude bankers' balances with one another, and likewise exchanges, since these items are essentially duplicative

and since their size has no necessary relation to the current flow of exchanges of goods and services. By a process of reciprocal deposit, two banks might run their bankers' balances due to and due from up to very large figures, yet the size of these balances would have no necessary relation to the flow of the country's economic life. Vault cash is also excluded, for essentially the same reasons. The exclusion is erroneous only to the presumably small extent that banks use vault cash in making purchases for their own account.[1]

Finally, it should also be pointed out that the statistical character of the several categories of money varies substantially, according to the length of the unit time period that is selected. The available data are most nearly complete on an annual basis—at the June call dates—though even then they are far from perfect. For other call dates, and still more for monthly or weekly figures, extensive interpolations based on estimates are required. It follows that we really know what money is statistically, in the sense of being able to measure its size with fair accuracy, only once a year. At shorter intervals we can merely make guesses, based on the behavior of large but not entirely stable samples.

[1] For more detailed and somewhat different definitions of money, see Dr. Lauchlin Currie, "The Supply and Control of Money in the United States" (1934), Chap. II.

A number of students may object to the inclusion, in the text above, of time deposits in "total" money; they may insist that time deposits are not money at all. Certain considerations that work against this view have already been suggested. In addition, it can be argued that, if there were no time deposits at all, a given quantity of demand deposits would support only a substantially lower money volume of transactions than it actually does, because, in the absence of time deposits, a substantial proportion of demand deposits would currently be kept effectively idle in order to constitute contingency funds and the like. Hence it can also be argued that changes in time deposits work on general economic conditions somewhat as do changes in demand deposits, but at one remove.

Chapter II

THE RELATION BETWEEN CURRENCY, BANK DEPOSITS, AND OTHER MAJOR ECONOMIC FACTORS

I. THE PROBLEM OF THE CURRENCY-DEPOSIT RELATION

ECONOMISTS who have had occasion to consider the question have commonly assumed that the ratio between the quantity of currency in circulation—coins of various kinds, government paper money, bank notes, etc.—and the quantity of bank deposits remains fairly constant over time. To American readers, perhaps the most familiar statements of this assumption have been those made by Professor Fisher,[1] but Mr. Hawtrey's not dissimilar views are almost equally well-known.[2] The assumption seems superficially plausible, and its simplicity makes it a convenient building block in the erection of broader monetary theories and doctrines; but, with respect to the United States through the last forty years or more, it is not correct. The ratio between currency in circulation and bank deposits shows marked seasonal variations, some suggestion of a cyclical movement, and for the period since 1893 a persistently declining trend.

A study of the actual behavior of this ratio in the past seems worth while on several grounds. One is the obvious

[1] Irving Fisher, "The Purchasing Power of Money" (1926), particularly pp. 50-55. See the passages on p. 52: "Both money in circulation . . . and money in reserve . . . tend to keep a fixed ratio to deposits. . . . If that ratio is disturbed temporarily, there will come into play a tendency to restore it."

[2] See especially the discussion of "internal drains" in "Currency and Credit," *passim*, and "Trade and Credit" (1928), p. 5. In the latter volume (p. 96) Hawtrey postulates a lag of currency expansion behind deposit expansion, but does not suggest a time duration for this lag.

general desirability of increasing in every way possible our knowledge of monetary relations and their changes, since these relations are of major importance to economic welfare in societies like ours. A second is the equally obvious desirability of supplementing empirical rules of thumb by more generally valid principles, if such principles can be found, for the guidance of commercial and central bankers in their interpretation and control of contemporary fluctuations in economic activity. Third, as already remarked, certain theoretical analyses and also certain proposals for monetary reform have rested in part on the assumption that the ratio here in question remains fairly constant over time. The substitution of a more accurate picture for this too simple assumption will permit the formulation of more realistic analyses and of more intelligent schemes for reform.[1]

The drawing of such a picture, however, is not an easy task. Weekly and monthly data from which deposits subject to check may be estimated are available only for Federal Reserve reporting member banks, and for them (omitting the war period) only since 1919.[2] The annual data on such deposits taken separately are available in the official statistics only back to 1909; the number of nonreporting banks makes the data on even total deposits increasingly uncertain for years earlier than about 1890. For currency in circulation, annual data are available over a considerable period, but even for recent years monthly figures can be obtained only by a somewhat hazardous process of estimate, based partly on an interpolation from reported vault cash in banks. It follows that, while some confidence may be placed

[1] See an article published jointly by the present writer and Karel F. Ficek, The Expansion of Bank Credit (*Journal of Political Economy*, February and April, 1933), for an outline of the effects which changes in the currency-deposit ratio have upon the limits on bank-deposit expansion—and therefore upon the methods and objectives of central control.

[2] But monthly data on net demand deposits of all member banks are available since 1923.

in the annual figures for the ratio between currency and deposits,[1] the monthly figures must be viewed at best as estimates rather than as assured statements of fact.

There is also a question over the choice of the particular statistical categories that are to be labeled "currency" and "deposits." The choice depends in part on the use one wishes to make of the results. With respect to deposits, we shall present the annual currency-deposit ratio both on the basis of total deposits and on the basis of (roughly) deposits subject to check alone. For monthly figures, however, we shall use only the latter basis—both to reduce the work of computation and because, as suggested in Chapter I, deposits subject to check are on the whole the more significant category.

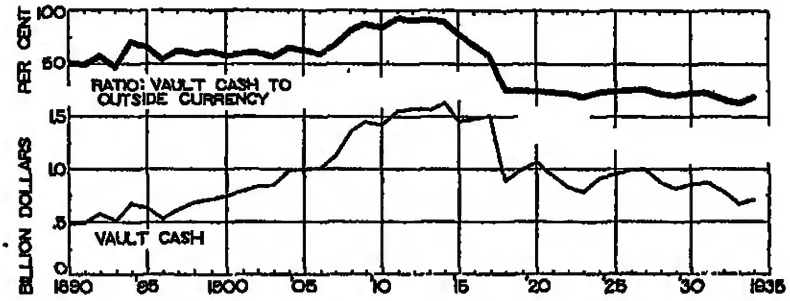
To make the phraseology less awkward, we shall hereafter describe this last class of deposits as "circulating deposits," parallel to the category of "circulating money" defined in the preceding chapter. Roughly, "circulating deposits" are all deposits subject to check which are owned by individuals or corporations other than banks, including United States deposits in commercial and Federal Reserve banks, with such duplicative items as bankers' balances and exchanges omitted or subtracted. The precise composition of circulating deposits and the relation of this category to those given in the existing statistics are indicated in connection with Tables I and II in the Appendix. Our "circulating deposits" seem to be nearly equivalent to the "adjusted demand deposits" which the Federal Reserve authorities have been reporting for member banks since November, 1935.

With respect to currency, we shall use "outside currency" alone; that is, currency in circulation outside all banks and the Treasury. Under the definitions given in Chapter I,

[1] The annual figures have a downward bias, however, because of the gradual decrease in the number and importance of the nonreporting banks.

currency in bank vaults is not "money," whereas our chief concern here is with monetary relations and habits. Vault cash is of primary importance in a study of the internal mechanics of banking administration and control, but not in a study of these latter more general relations, which in the first instance are external to the money-creating bodies themselves. The exclusion of vault cash does not

CHART I.—VAULT CASH, ANNUALLY: 1890–1934



greatly affect the results in most years, because the ratio between it and outside currency was fairly stable at around 60 per cent from 1890 through 1906, and again at around 24 to 25 per cent from 1918 through 1931; it fell, presumably temporarily, in the recent period of acute hoarding (see the accompanying Chart I).[1]

II. GENERAL CHARACTER OF THE CURRENCY-DEPOSIT RELATION: ANNUAL DATA, SINCE 1890

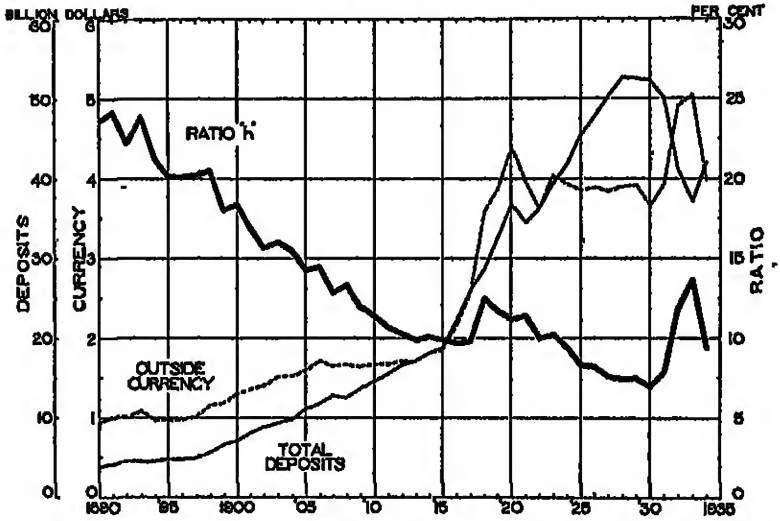
The broad character of the relations between outside currency and deposits since 1890 is shown on the accompanying Charts II and III. These charts are based on annual figures at the June call dates. The data themselves and their

[1] Apparently the 1907 panic and currency shortage made so great an impression on the banks that they determined not to be caught again; by 1911, currency in bank vaults was nearly equal to that in circulation outside all banks. The inauguration of the Federal Reserve system, however, seems to have ended the bankers' fears; since 1918 they have kept little more than literally till money.

composition are given in Table I of the Appendix. Both categories of deposits include United States deposits.

Chart II shows outside currency, total deposits, and the ratio *h* between them. The vertical scales are so arranged as to bring the currency and deposit curves fairly close together for easier comparison. It is evident that, up to 1921, outside

CHART II.—OUTSIDE CURRENCY AND TOTAL DEPOSITS, ANNUALLY: 1890–1934



currency and total deposits were following roughly similar paths of movement. To 1915, however, total deposits increased relatively more rapidly, with the result that the ratio curve declined fairly consistently. The war and the postwar boom, for a variety of reasons, produced a tremendous increase in the quantity of currency required for outside circulation. It more than doubled in five years. Although total deposits also increased, at first they increased relatively less rapidly. In consequence, the ratio curve rose for a time, but by 1919 it had resumed its downward drift.

After the 1920 boom total deposits declined a little, and then began to rise again, almost as rapidly as from 1916 to 1920. Outside currency fell relatively much farther after

1920, continued the decline a year longer, and then leveled off. Indeed, a straight-line trend fitted to the currency curve from 1920 to 1930 would have a slight downward tilt. The contrast here between the currency curve and the total-deposits curve is striking. There have been other periods when outside currency remained nearly constant (1890–1897, 1906–1913), but in neither of these periods were deposits and general business activity expanding as rapidly as in 1921–1929. One might therefore be tempted to infer that the currency habits of the people changed abruptly after the war. Examination of the ratio curve shows, however, that this inference would be incorrect. The ratio between outside currency and total deposits rose sharply in the two war years, but then resumed that fairly steady decline which goes back at least to 1893, and resumed it at nearly the same average rate of relative decline per year as before.[1]

With the onset of the world depression both outside currency and total deposits began to decline, currency moving relatively more sharply. Deposits continued to fall until 1933, but outside currency suddenly rose again in

[1] It is interesting to note a similar decline in England, at almost exactly the same rate as in the United States, for the years 1925–1930. The English figures are much higher, however, a fact only in part accounted for by the somewhat higher proportion of deposits subject to check in total English deposits. See J. E. Meade, The Amount of Money and the Banking System (*Economic Journal*, March, 1934), p. 80. Converted to the same basis as ours (outside currency divided by total deposits alone), the English figures are as follows (the American figures are added for comparison):

Year	Great Britain	United States
1925	0.174	0.083
1926	0.170	0.082
1927	0.162	0.076
1928	0.156	0.074
1929	0.148	0.075
1930	0.146	0.070

1931. It seems clear, however, that this latter rise was due chiefly to hoarding produced by the growing general distrust of the banks, rather than to any permanent change in the currency habits of the people or any increase in the volume of those exchanges which call for currency.[1] By 1934, with the revival of confidence in the banks, the currency figure had fallen almost to the 1929 figure. The ratio curve gives a measure of these various reversals, but its movements from 1931 to 1934 reflect factors quite different from those dominant in the earlier years.

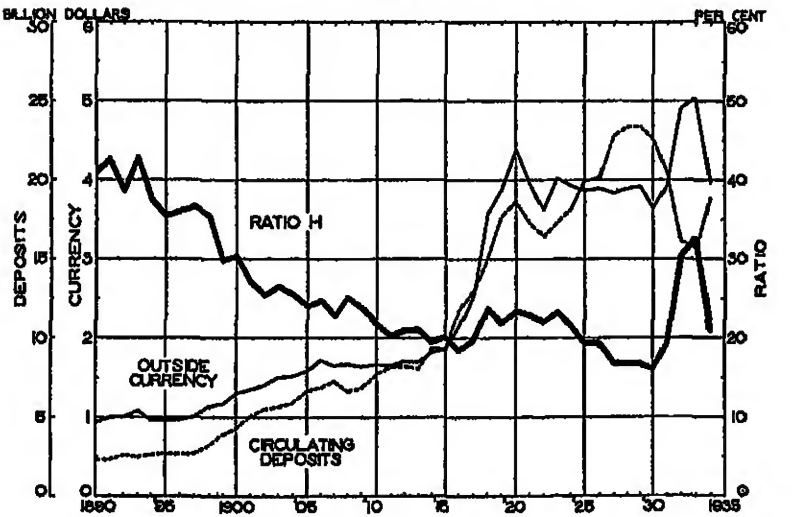
Chart III is analogous to Chart II, except that instead of total deposits it presents adjusted deposits subject to check, including United States deposits; this category we have designated as "circulating deposits." Logically, Chart III should be more significant than Chart II with respect to monetary relations and habits, since Chart II includes elements—namely, time and savings deposits—which as a rule do not themselves serve as media of exchange. The practical difficulty is that reasonably complete statistics on circulating deposits taken separately are not available until 1909; the figures for the earlier period rest in part on estimates and interpolations (see Table I in the Appendix). Hence Chart II, while it includes elements we would prefer to omit, is statistically more reliable.

Up to 1907, circulating deposits averaged between 55 and 60 per cent of total deposits, from 1908 to 1921 about 50 per cent, and after 1921 about 42 per cent (see the Appendix, Chart XXV). Hence the curve showing the ratio H between outside currency and circulating deposits is roughly twice

[1] This conclusion is also supported by the statistics on currency of small denominations—such as is used for most cash transactions—in circulation outside the Treasury and the Reserve Banks. This quantity, as adjusted for seasonal, continued to decline until the end of 1932; from then till the end of 1934 (the latest figures available at the date of writing) it rose steadily. The currency hoarding was evidently hoarding, in the main, of Federal Reserve and National Bank notes and of gold certificates.

as high numerically as that showing the ratio between outside currency and total deposits, and it has a somewhat less pronounced downward drift. The general paths of the two curves are evidently similar, however, as are most of the year-to-year fluctuations; such differences as occur are due to unusually pronounced year-to-year shifts in the proportion between circulating deposits and total deposits. It should be

CHART III.—OUTSIDE CURRENCY AND CIRCULATING DEPOSITS, ANNUALLY: 1890–1934



pointed out in particular that, whereas marked year-to-year changes in outside currency preceded those in *total* deposits at two points (1906–1907 and 1929–1930), and lagged behind at least once (1921–1922), the year-to-year changes in outside currency appear to be more nearly (though far from exactly) simultaneous with the changes in *circulating* deposits shown on Chart III. But an apparent indifference of outside currency to large increases in deposits is evident in 1908–1911, and still more clearly in 1923–1928, for both deposit categories. In 1906–1907 outside currency appears to lead both. Inferences as to leads and lags drawn from once-a-year data

of this sort, however, must necessarily be viewed as inconclusive.

The general character of the currency-deposit relation over the last forty-five years is thus the same, no matter which deposit category is made the base. On both bases the drift of the currency-deposit ratio has been persistently downward, and with an average annual rate of *relative* decline which has been fairly constant as between the several main divisions of the total period (this last fact would show up more clearly on a logarithmic chart). The only major exceptions to these generalizations were the war years and the period of abnormal currency hoarding in 1931–1933. Following the war, the annual ratio based on total deposits resumed its decline after 1920, whereas that based on circulating deposits remained high until 1923. But it will be seen later (Chart IV) that the 1923 peak in the annual ratio figures derived from circulating deposits was not representative, since the annual figures are derived from data for the June call dates alone. The monthly ratio figures show that the average for 1923 as a whole was substantially lower than the 1920 peak.[1] After 1933 both ratios fell heavily. It seems reasonable to expect that as more "normal" business and banking conditions are restored, they will resume something like their previous slow downward movement, as they did after the war.

Regardless of the varying interpretations that may be placed on matters of detail, it is therefore clear that the one thing which is *not* true of the currency-deposit relation is, that it is fairly constant over time. The frequent assumption to this effect is quite unwarranted. Over a period of forty-five years the broad movement of the currency-deposit ratio has been persistently downward. In other words, a steadily

[1] It is also possible that our estimates of circulating deposits from 1921 to 1926 are too low, and hence that the ratio derived from them is too high in these years. See the note to Table I, in the Appendix.

diminishing proportion of our total supply of media of exchange has consisted of currency, a steadily increasing proportion of deposits.[1] The two major exceptions, 1917–1918 and 1931–1933, can be accounted for without impairing the general conclusion that the money habits of this country have been persistently changing in the indicated way. It also seems plausible to infer that this downward movement is likely to persist for some time to come, though doubtless at a diminishing rate.

Certain other facts and suggestions can be drawn from the above charts. These relate chiefly to the apparent presence or absence of cycles in the data. Now the data are merely figures for one day in each year, the June call date, and at times they are apparently not even very representative of the given years (as already remarked for 1923). Any inferences concerning cycles which are derived from data of this sort must therefore be extremely hazardous. Nevertheless, we may venture a few tentative comments with respect to Chart III, where the basis is circulating deposits. Substantially analogous comments can be made with respect to Chart II, based on total deposits, but they are rather less clearly suggested by the curves.

First, it is fairly clear that the concept of cyclical movements around a reasonably simple trend of low degree does *not* apply to the movements of the annual data for outside currency from 1890 to 1930 (the currency hoarding from 1931 to 1933 makes the data for those years irrelevant for present purposes). For the period as a whole, the quantity of outside currency had a heavily marked upward movement. But the rise took place in a series of steps, with rather long

[1] This is *not* the same thing as saying that a diminishing proportion of total money *payments* is conducted with currency. It is possible, though improbable, that the velocity of turnover of outside currency has increased, relative to that of deposits, by an amount great enough to offset the decline in its relative quantity. No adequate evidence is now available on the velocity of currency. The velocity of turnover of deposits is examined in Chap. IV.

platforms in between and with rather little downturn after each increase. Roughly, the platforms came in 1890–1897, 1906–1913, and 1923–1929. A smooth trend of low degree could not be fitted to these data without seriously distorting the apparent facts, while a better fitting trend, perhaps of the seventh or eighth degree (to 1929–1930), would absorb nearly all of any "cycles" that might be thought to exist.

Second, it also seems apparent that the concept of cyclical movements around a low-degree trend does not apply to the movements of the annual data for circulating deposits, for the period 1890–1934 as a whole. To make such a trend fit at all closely, the data would have to be divided into at least three periods: roughly, 1890–1915, 1915–1920, and 1920–1934. If this were done, peaks of a sort would probably appear in circulating deposits in 1892, perhaps in 1899, and again in 1901–1902; in 1907, 1911, and 1914; perhaps in 1916, and in 1920; perhaps in 1925, and in 1927–1928. (On the latter period, see also the data presented on Chart IV.) It would clearly be difficult, however, to associate these peaks—many of which are only minor oscillations—with anything that can reasonably be described as a characteristic "cyclical" fluctuation of the data around a postulated central tendency or trend. There is too little uniformity in period, amplitude, or general pattern. This is not to say that such cycles do not exist in circulating deposits. But if they do exist, they do not stand out clearly in the once-a-year data thus far examined.

Third, it seems similarly apparent that there is no unequivocal "cycle" in the movements of the ratio between outside currency and circulating deposits in the period 1890–1934, even if the series is broken at 1917–1918. There are, it is true, a number of peaks in the generally downward path of the data. In the prewar period, however, the more marked peaks occur around the dates of financial crises, and relative

to the general pattern of the ratio curve, they look more like comparatively isolated phenomena than like the high points of truly cyclical movements. In the period 1920–1930, the peaks are not clearly marked. It is tempting to hold that the proportion of currency in the total volume of media of exchange declines when economic activity is expanding, and rises when it is shrinking, but the data here presented do not furnish adequate evidence either for or against such an hypothesis.

It must be emphasized, however, that these comments on the apparent absence of cyclical movements cannot be taken as conclusive. The figures here used are for one date a year alone. The statistical base provided by such figures is so unreliable that it has not even seemed worth while, for present purposes, to fit trends to the data. The monthly figures for 1919–1934 are examined more intensively below, and may be thought to support a different conclusion.

Finally, there is no clear evidence in these once-a-year data either that deposit expansion or contraction "causes" currency expansion or contraction, or that the opposite relation holds. At times currency changes appear to precede changes in deposits, as in 1906 for both categories of deposits and in 1929 for total deposits. At other times, however, the two are substantially indifferent, as in 1907 or 1908 to 1913 and in 1923–1929, or even move inversely, as in 1930–1934. Instead of trying to postulate any simple and direct "causal" relation between currency and deposits, it seems better at this point to suppose that the relation is indirect, running through more or less common antecedent forces, and that these forces are not of such character as to produce any very intimate year-to-year connection between the two factors. In the next section, however, it will be shown that the monthly data suggest a somewhat closer relation than can be inferred from the once-a-year figures hitherto examined.

III. THE CURRENCY-DEPOSIT RELATION: MONTHLY DATA SINCE 1919

Monthly data on the relation between outside currency and circulating deposits are presented on Chart IV for the period 1919–1934; the monthly figures before 1919 are uncertain. The data themselves, and the processes by which they were computed, are given in Table II of the Appendix. The circulating deposit figures are estimates based on interpolations derived from the monthly data for Federal Reserve system member banks, to give national totals between the annual figures on June call dates which were previously presented.[1] The outside currency figures are monthly Treasury data on currency outside the Treasury itself, minus estimated currency in bank vaults. The latter estimates are interpolated between the June call dates on the basis of data for member banks on the other call dates. For monthly figures between call dates, it is arbitrarily assumed that outside currency fluctuates in proportion to the sum of outside currency and vault cash. Since vault cash has in recent years averaged less than 20 per cent of this latter sum (see Chart I), the error involved in this estimate is not likely to be very serious.

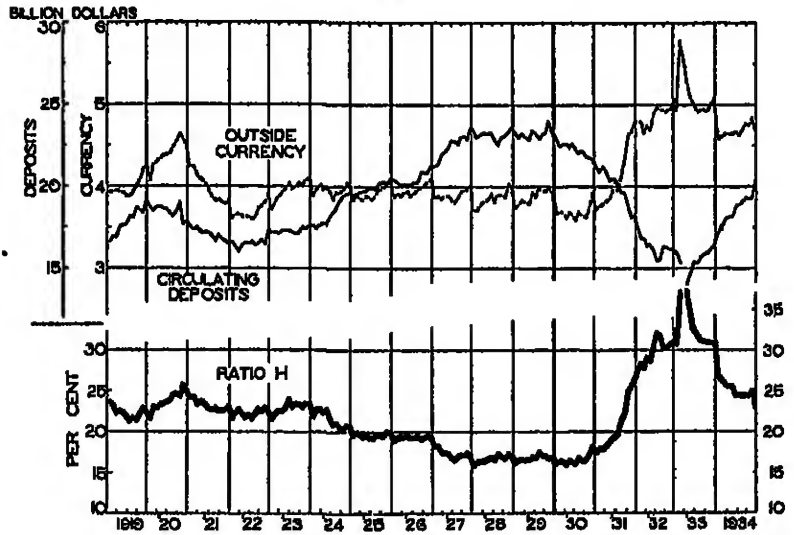
These procedures, of course, can yield only approximations. Moreover, since the banks that do *not* appear in the monthly figures used as the basis for the interpolations are chiefly the smaller country banks, and since the items here in question are presumably more sluggish for such banks than for the reporting banks in the larger cities, it seems probable that both the currency and the deposits estimates exaggerate somewhat the actual month-to-month

[1] In certain years these estimates for deposits differ widely from those given by Dr. Lauchlin Currie in "Supply and Control of Money in the United States" (1934). The sources of the differences are considered briefly in connection with Tables I and II in the Appendix; their implications are touched on in a footnote on p. 57.

fluctuations between the June call dates. The figures for the ratio between currency and deposits are hence exposed to a double possibility of error. The two sets of errors, however, are probably independent in considerable degree.

Despite the defects indicated, which could perhaps be reduced by more laborious methods, the procedures adopted

CHART IV.—OUTSIDE CURRENCY AND CIRCULATING DEPOSITS, MONTHLY: 1919–1934



appear to yield fairly significant results. These results bear on the characteristics of the currency and deposits series themselves, on the ratio between the two series, and on their relation to statistical measures of other important factors in economic life. In the present section we shall deal only with the internal characteristics of the two series, and with the ratio between them.

The principal characteristics of the currency and deposits series can be gauged fairly well from the curves on Chart IV. These curves present the data without adjustment for seasonal fluctuations or for trend. The several computed seasonals, trends, and residual "cycle-accidental" com-

ponents are depicted in the subsequent charts in this chapter, where they are compared with the similar components of other series. To avoid a laborious duplication of charts, they are not given separately at this point.

First, even from Chart IV it is obvious that outside currency has a marked seasonal variation, which is especially clear in the years 1922–1930. The seasonal itself is given on Chart V. It is low in January, rises steadily through June, falls in July, and then rises steadily through December.[1] Its range is between 97.4 and 103.8. There is also a small seasonal in circulating deposits (again see Chart V), but it is more complex and is much less important relative to the other statistical components in the total movements of circulating deposits. This seasonal is low in February and August and high in September, October, and December. The range is only between 98.3 and 101.1. Hence the movements of the circulating-deposits seasonal are not in marked contrast to those of outside currency. But it would be erroneous to deduce from this that there is a causal relation between the two seasonals running from deposits to currency. Both are high in December, but, whereas currency falls to its yearly low in January and at once rises, circulating deposits continue falling until February. Currency reaches a second bottom in July, deposits not until August; and the November dip in deposits has no counterpart in currency. (It must also be remembered, however, that the amplitudes of both seasonals are rather small.) The two seasonals are compared with those of certain other series in the next section. The curve for the ratio between outside currency and circulating deposits also suggests the existence of a moderately clear though small seasonal (not computed here), which is apparently dominated in the main by the currency seasonal.

[1] Computed only for 1922–1930; see the footnote to Chart V. The movements in the preceding and subsequent years are not inconsistent with the 1922–1930 pattern, but because of wider fluctuations of the data they are harder to isolate statistically. The seasonal for circulating deposits was computed for 1919–1932.

Second, Chart IV casts further light on the question of trends and cycles in currency and deposits, discussed in the preceding section. It will be recalled that the once-a-year data for 1890–1934, presented on Charts II and III, gave no clear evidence for the existence of anything that could properly be called a "cyclical" movement in either currency or deposits. Some other type of concept seemed to be required. With respect to outside currency, this conclusion is also supported by the monthly data for 1919–1934, just given on Chart IV. To 1930, the most conspicuous fact about the outside-currency curve on that chart is its nearly horizontal movement, especially after 1922. The fluctuations in 1923–1929 were obviously only minor incidents. The "peaks" in 1920 and 1933 had such completely different proximate origins that they cannot possibly be explained in terms of a single self-consistent pattern of cyclical movements which is applied to the period 1919–1934 as a whole. The cyclical concept, at least in any ordinary sense of the term, seems wholly inappropriate here. This conclusion is reinforced by the behavior of the perhaps debatable curve for the cycle-accidental component of the currency series, given on Chart VIII and there discussed (also see Chart VII).

With respect to circulating deposits, however, the case for rejecting the cycle concept entirely is less clear for the monthly data of 1919–1934 than it was for the once-a-year data of 1890–1934. To form an adequate picture of the monthly movements in 1919–1934, it is also necessary to turn forward to Charts IX and X, discussed in the next section. These charts, in conjunction with those already presented, show that in 1919–1934 circulating deposits experienced at least two types of major oscillations—apart, that is, from the minor seasonal fluctuations already discussed. In the first place, there were one and a fraction "long swings" in this period, having peak levels in 1919–1920 and in 1927–1929, and low points in 1922 and 1932; the

two low values are nearly the same. Reference to Chart III, however, shows that the rise which ended in 1920 really began at levels far under the low points of 1922 and 1932. The starting place must be sought at least as far back as 1915. It therefore seems impossible to treat the "long swing" of 1922–1932, which in itself alone looks like a single long cycle, as part of a self-consistent pattern of similar long cyclical movements extending over time. Except for the fact that major oscillations were involved in both, the "long swing" from 1915 to 1922 was in nearly all respects unlike that from 1922 to 1932. Moreover, there is no "long swing" of analogous pattern or sharpness in 1890–1914, but only a fairly steady rise. Thus the concept of cycles, in any useful sense of the term, seems inapplicable to these longer movements of circulating deposits after 1890.

In the second place, however, circulating deposits do undoubtedly reveal rather irregular oscillations of shorter periods around their apparent "central tendency" in the period 1919–1934. These oscillations are shown on Charts IX and X. They are there described as "cycle-accidental" residuals (the quantities remaining after removal of the computed trends and seasonal factors). But there are two difficulties in the way of regarding these oscillations as constituting genuine cycles. One is their lack of uniformity in either amplitude, general pattern, or—most conspicuously—period. This lack makes it hard to view the cycle-accidental residuals as providing a firm basis for generalizations about the past behavior of circulating deposits, or about their probable future movements. Different students, however, may attach different degrees of importance to this difficulty.[1]

[1] This involves the basic question of what cycles are and what we wish to use them for. On this point there is marked disagreement among students. To be described as "cycles," however, it seems reasonable to require that given oscillations shall either show a substantial degree of uniformity in their own internal statistical behavior, with respect to such characteristics as general pattern, amplitude, and period, or shall at least show a substantial degree of uniformity in their relations

The other difficulty is more serious. By fitting computed trends of a higher order than those used on Charts IX and X, and particularly by fitting them for somewhat different periods within the aggregate span, appreciably different cycle-accidental patterns are obtained. Consider, for example, the effect of fitting a single trend of not more than third degree to the whole period 1919–1934, instead of breaking the trend at the end of 1929, as is done on Chart IX. Consider also the effect of beginning the trend, for the period to 1930, in 1922 instead of 1919. Such alternative procedures would materially shift the time-location of a number of the peaks and valleys, and might even turn some high cycle-accidental values into low values. Experiments indicate that the data in the years 1925–1926 are especially susceptible to the effects of such changes in the trends selected.

Considerations of this last sort are likely to subject the student to some embarrassment. They compel him to defend the particular trend he has selected against the claims of other possible trends, of different orders and perhaps computed for somewhat different periods. That is, they compel him to "explain" or justify some one trend on the basis of its general logical meaning in the given context and in terms of the known relevant facts about economic events and processes. A trend, to be regarded as solidly established, must be a significant generalization from *all* the available relevant facts, statistical and otherwise, not merely a mathematical abstraction from a particular array of numbers. It must be admitted at once that such a defense, for some one particular trend as against others, is extremely difficult to make with respect to these currency and deposits data.[1] We shall not

to the movements of other types of data. If neither requirement is met, no significant generalization which runs in terms of cyclical concepts can be derived from the oscillations.

[1] A further familiar difficulty is that, as trends of successively higher orders are used, they give (in the main) successively closer fits to the original data. That is,

attempt the defense here, and shall rest content with the foregoing brief statement of the nature of the problem. The trends shown on Chart IX, for example, were selected merely because, while being of low order, they do not do serious violence to the original data. The same thing is true of a number of the trends fitted to other data in the present studies.

On balance, therefore, it seems better not to try to ascribe genuinely "cyclical" movements to circulating deposits in the relatively brief period for which monthly data have here been compiled. Neither the "long swings" nor the shorter "cycle-accidental" fluctuations seem to have characteristics which make it useful to describe them as "cycles." This is not to say that such cycles do not actually exist in deposits,

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the computed trend comes to resemble more and more closely the original data themselves. This threatens to become a *reductio ad absurdum*. In rigorous logic, perhaps, a trend should be used (and removed) only when it can be assigned definite meaning as a generalization of forces, operations, and relations that can be described or postulated with some assurance. The length of time period used as the basis in the computation of the trend is also of profound importance. Logically, a trend should not be computed for a period longer than that over which the particular forces, which the trend is assumed to generalize, can be supposed to remain in operation on a significant scale.

Yet if these precepts were conscientiously adhered to, it is probable that few trends would ever be fitted to economic data. The precepts can be applied unequivocally only where the general nature of the objective phenomena to which the original statistical data relate, and the general nature of their connections with other allied and important economic factors, are already fairly well understood. There is, however, another obvious use for trends. In dealing with materials in which the nature of the dominant factors, the duration of their operation, and the like are not clearly established beforehand (as is commonly the case with economic data at present), the computation and removal of simple trends for the available periods of time (the periods being subdivided if some good reason can be given) is often the only way of getting even a first approximation of the location and character of the dominant factors. In such cases, however, it must be remembered at each point that the trends obtained are merely statistical, not logical, generalizations from the data.

For a more extended discussion of a number of these questions, and particularly for a demonstration from actual examples of the sometimes spectacular changes in the pattern of the residuals, which may be produced by rather small changes in the period or in the degree of the selected trend, see the article by Edwin Frickey in the *Review of Economic Statistics*, Oct. 15, 1935.

of course, but the data and procedures here used do not clearly demonstrate them.[1]

A third major problem raised by the monthly data for outside currency and circulating deposits presented above is the problem of the causal connection between the two, or the lack thereof. Since there appears to be no significant relation between the seasonals of the two series, the problem could perhaps be attacked somewhat more easily by using for outside currency a curve from which the seasonals have been removed (see the charts below), but the unadjusted data of Chart IV can be used almost as well (the seasonal in circulating deposits is so slight, relative to other factors in play during this period, that its removal makes little difference to the comparison). Even a superficial inspection of Chart IV suggests that from 1919 to the latter part of 1929 a fairly characteristic relation was manifest between changes in outside currency and changes in circulating deposits. (Comparisons of these data between 1930 and 1933 are made valueless by the currency hoarding of the period, which cannot be allowed for accurately, and by the bank closings.) This relation consists in the lead that circulating deposits usually maintained over outside currency. Deposits reached a peak at the end of 1919 (the secondary peak in October, 1920, was perhaps due to an "accidental" factor), currency in October. Deposits reached a bottom in March, 1922, while currency stayed low till July or August. The rise in deposits ceased at the end of 1922; in currency not until the end of 1923. The next big rise in deposits began in the middle of 1924, whereas currency drifted lower till the middle of 1925. Deposits slackened early in 1926, and then rose rapidly.

[1] Also see footnote on p. 28. It should be emphasized, in addition, that the data cast no light on the possibility that several *different* cyclic forces, with different periods, may have been operating on deposits simultaneously. Such a concatenation might well have produced an apparently irregular distribution of large peaks and valleys in deposits as the result of apparently irregular conjunctures of cyclic forces, each of which was regular with respect to its own period.

Currency turned down at the end of 1926, and did not rise again until early in 1928 (after allowance for the seasonal factor; see Chart VIII). By that time the rise in deposits had virtually come to an end. The downturns at the end of 1929 were nearly simultaneous, though when currency is seasonally adjusted it shows a slight lead.

In most cases, circulating deposits thus led outside currency by substantial though variable amounts in 1919–1929. This seems to confirm Mr. Hawtrey's hypothesis, referred to at the beginning of the present chapter, that currency in circulation increases at the end of a boom, thus putting further strain on the banks, and that its decreases in times of recession encourage banks to expand by enlarging their reserves. The events from 1919 through 1922 are consistent with this hypothesis, though other evidence would be required for a satisfactory testing. The period from 1923 to 1929, however, is a different matter. The changes in outside currency were so small in absolute terms that they cannot have materially affected the contemporary operations of the banking system, and they therefore cannot be given an important place in general theories dealing with this period.

This leaves the question of causality unanswered. We are not compelled, of course, to attempt any answer at all. The facts thus far presented, however, clearly cast doubt on the defensibility of postulating a *direct* causal connection between outside currency and circulating deposits. Certainly an increase in deposits does not in itself evoke an increase in outside currency, nor does a decrease evoke a decrease. Rather, changes in both magnitudes probably result from the working of other forces—forces which, with respect to periods of say one to two years in length, apparently affect outside currency somewhat less quickly than they affect circulating deposits. It is familiar that neither magnitude is among the first things to move when the degree of general business activity changes, and it would therefore seem a

priori unreasonable to postulate any simple and direct relation between changes in the two magnitudes themselves. The *inverse* movement of the two series from the end of 1930 to 1934, though it can be proximately explained in terms of currency hoarding and bank failures, also raises difficulties in any attempt to draft a general statement of causal relations.

These comments are based on an examination of monthly data over a relatively short period. The reader may also be reminded of the comments in somewhat similar vein presented at the end of the preceding section and derived from an examination of the annual figures since 1890.

Finally, the behavior of the ratio between outside currency and circulating deposits on a monthly basis is necessarily the resultant of the degrees of relative change in the two component series. From the monthly figures (Chart IV) it is evident that this ratio (H) reached its postwar peak at the end of 1920; the apparent second peak in 1923, which appears in the annual data (Chart III), was due to the accidental rough equality of the June values in 1920 and 1923. After 1920 a fairly steady decline, interrupted only in 1923, continued to the beginning of 1928; then the curve stayed flat until the latter part of 1930, when currency hoarding began to appear. The evident seasonal in the ratio curve, as previously remarked, is due chiefly to the seasonal in outside currency. The generally declining trend of the curve from 1920 to 1928 is due to the rapid rise of deposits in the face of comparative stability in currency. Subpeaks relative to the general trend can be picked out (after making a rough visual allowance for seasonals) in the middle of 1923, the end of 1926, and the latter part of 1929. This lends some support to the view that the ratio, like outside currency itself, rises at the end of periods of business activity and does not reach bottom till after business has begun to pick up. Compare the curves, for various broad indices of economic activity, given on Charts VII to X, below. The size of these subpeaks and

valleys is not great enough, however, for them to carry any great weight of argument.

The lack, in either the currency or the circulating-deposits data, of clearly marked oscillations of types which can fairly be regarded as "cyclical" makes it seem unlikely that the ratio curve would show such cycles. Examination of Chart IV confirms this expectation with respect to the monthly data for 1919–1934. A similar negative conclusion, it was recalled, was reached at the end of the previous section with respect to the annual data for 1890–1934.

IV. CURRENCY, DEPOSITS, AND OTHER SERIES: SOME COMPARISONS

The two preceding sections have shown that the movements of currency and deposits are not very closely related to one another statistically, and that their movements are certainly neither equivalent in degree nor always even roughly synchronous. These questions then inevitably arise: with what other economic magnitudes are the two in actuality most intimately connected, and what forces chiefly determine their fluctuations?

No attempt will be made here to find complete answers for these questions. The questions themselves are at the very center of the general theory of monetary relations and operations, and their solution—if, indeed, any definitive solution at all is possible—requires a far more elaborate apparatus of statistical data and theoretical analysis than can be offered in the present essentially exploratory studies. A process of simple comparison with certain other important statistical series and their components, however, yields a number of interesting results—results not less significant because some of them are quite clearly negative. For the monetary side of the comparisons, we shall use only outside currency and circulating deposits. The ratio figures seem less significant for these purposes, while the figures for

total deposits contain time and savings deposits, which we should in any event not expect to be closely related to the other types of series now to be considered. The comparisons deal both with seasonal fluctuations and with the main paths of movement of the several series; where it seems worth while, a separation into trend and cycle-accidental components will also be made. We begin with a comparison of the seasonal fluctuations. They are the simplest to describe, and the relations involved are fairly typical of the more complicated relations examined at later points.

The outside-currency and circulating-deposits seasonals in the postwar years are compared with certain other relevant seasonals on the accompanying Chart V; the currency and deposits data are not available for the period before the war. The currency and deposits seasonals are based on the periods 1922–1930 and 1919–1931, respectively. They are simple geometric averages (averages of logarithms) of the estimated monthly figures previously presented. The other seasonals, which cover somewhat different periods, were either copied directly from the sources indicated below or were computed by simple geometric averaging.[1] The deposits seasonal is also given at the bottom of the currency chart for comparison

[1] The currency and deposits seasonals and their composition are given in Table III of Appendix B; the method of computation is discussed in Appendix C. The sources of the other seasonals are as follows: Industrial production, 1919–1930: computed from Federal Reserve Board data. Freight cars loaded, 1925–1929: computed by Dr. Simon Kuznets (see below) from American Railway Association data; the Federal Reserve Board also obtains its index numbers from this source. Construction contracts awarded, 1919–1934: computed from Federal Reserve Board data (Dodge figures). Wholesale trade (9 lines), 1921–1927: computed by Kuznets from Federal Reserve Board data. Number of shares traded and par value of bonds sold on the New York Stock Exchange, 1919–1931: computed by Kuznets from data on shares in the *Commercial and Financial Chronicle* and from data on bonds in the *Annalist*. Exports, 1921–1927, and imports, 1924–1928: computed by Kuznets from Department of Commerce data. Department-store sales (adjusted), 1919–1926: computed by the Federal Reserve Board. Factory pay rolls, 1919–1929: computed from Federal Reserve Board data. Retail sales (adjusted), 1919–1927: computed by Kuznets, from data of Professor M. A. Copeland. Retail food prices, 1922–1930: computed from data of the U.S. Bureau of Labor Statistics. Money volume of stock

with the currency seasonal. It will be seen that on both charts the *absolute* amplitudes of fluctuation of the several seasonals are widely different; close attention to the scales is necessary. The large fluctuations of all the original series in 1931–1934 make the computation of seasonals for this period, taken separately, of uncertain value, and it has therefore not been attempted here. In order that the seasonal curves may "close," they all begin and end with the December values.

As previously remarked, the outside-currency seasonal (Chart V*a*) rises quite steadily through the year, except for the dip in July. December is its high point. Among the other series here examined, that for department-store sales most closely resembles the currency seasonal, though its amplitude is much greater.[1] Retail sales drop from April through July, whereas currency drops only in July; but they have a similar characteristic rise through to December, which is their high point. Factory pay rolls, like currency, are low in January and July, and are above

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sales on the New York Stock Exchange, 1919–1934: computed as explained in footnote accompanying Chart IX.

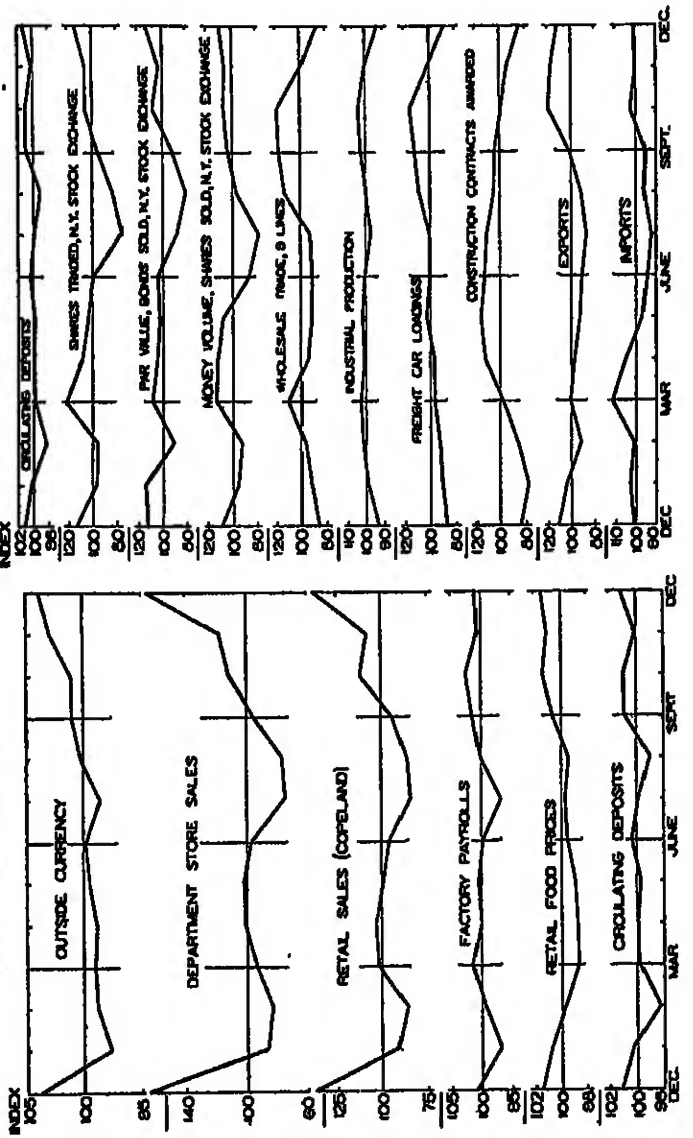
The seasonal indices computed by Dr. Kuznets are given in his "Seasonal Variations in Industry and Trade" (1933), Appendix I.

The seasonal patterns for currency and deposits given on Chart V are in some respects substantially different from the patterns, based only on National Bank figures at call dates, which were given by Professor Allyn A. Young in his "Analysis of Bank Statistics for the United States" (1928), pp. 15, 17, for the period 1901–1913. On the other hand, for the period 1915–1925, his outside-currency seasonal is quite close to ours; *ibid.*, p. 54. Professor Young's data thus suggest that the introduction of the Federal Reserve system produced a great change in seasonal habits with respect to currency. His data for the earlier period, however, necessarily contain possibilities of fairly large error.

The several curves are deliberately drawn on different scales in order to bring out their turning points and their internal patterns. For present purposes, these features seemed more important than a comparison of the absolute magnitudes of the seasonal fluctuations.

[1] The department-store seasonal also has a much greater amplitude than total retail sales. For the seasonals in other types of retail trade (1919–1926), see the *Federal Reserve Bulletin*, 1928, pp. 235, 238.

CHART V.—COMPARISONS OF SEASONALS: CURRENCY, DEPOSITS AND OTHER SERIES, MONTHLY: SINCE THE WAR



the mean in December, but they have two higher peaks in March and October. Thus they are not very close to the currency seasonal. The differences between the two in November and December suggest that industrial workers, as well as other groups, begin accumulating currency holdings against their holiday-season expenditures well ahead of time; from Chart V*b*, it is clear that in these months factory pay rolls move down with industrial production. Retail food prices are likewise seasonally high in December, but then fall through March. They dip slightly in August, instead of in July, but otherwise resemble the currency seasonal fairly closely for the rest of the year. It is also interesting to note that car loadings, shown on Chart V*b*, quite closely resemble the currency seasonal from January through September, except that from June to July they have a platform instead of a drop. Like industrial production, however, they reach a definite peak in October instead of in December. New York security sales, like currency, also rise from July or August through December, but in the first part of the year their trend is in general downward, not upward. The other industrial and commercial seasonals, presented on Chart V*b*, are definitely unlike the currency seasonal.

These comparisons would be more satisfactory if similar seasonal indices of farm receipts and expenditures of money had been tested here, but, even so, the comparisons enable us to account for a large part of the "trend" and the fluctuations in the currency seasonal. Both of the retail transactions series are low in January and high in December, with dips in July and August. Retail food prices also rise from March to December. Factory pay rolls, on the other hand, move differently from currency from March to June and in the last two months of the year. These facts suggest that the dominant factor in the outside-currency seasonal is—as might be expected—retail transactions, rather than whole-

sale, industrial, or financial operations; and that this dominant factor is more nearly the volume of individual expenditures than the volume of the smaller individual incomes, so far as these last can be judged from factory pay rolls. The seasonal movement of car loadings is presumably largely irrelevant to the currency seasonal, since the bulk of the payments for freight shipments are not made in currency.

The seasonal in circulating deposits (Chart V*b*) has hardly half the amplitude of that in outside currency; it is more complex; and it is much less clearly marked in the raw data. In consequence, not a great deal of significance can be attached to it. Indeed, the significant thing is the fact that deposits show so *little* seasonal. This lack can be accounted for on either of two grounds. First, it may chance that the extremely diverse factors which might be expected to influence the deposit seasonal have themselves different seasonal patterns, and that these differences roughly cancel out. Second, it can be contended that the volume of deposits is relatively inert: that a seasonal slackening in the demand for deposits to make payments, for example, leads chiefly to the building up of idle deposit balances, rather than to the outright extinction of deposits through loan repayments or purchases of securities from the banks. The limited evidence here presented lends more support to the first view with respect to seasonal relations, though it does not refute the second.

On Chart V*b*, the circulating-deposits seasonal is compared with certain other seasonals. All but two of them (industrial production and imports) are below the average value in February, as are deposits. All except that for freight cars loaded are likewise low or falling in July or August, while deposits are also low in August. But whereas deposits reach their seasonal peak in December, industrial production, car loadings, and wholesale trade all reach

their seasonal *bottoms* in December.[1] Construction contracts awarded are also low at that time. Only New York security sales, exports, and imports are high in December. Yet one would not expect the rise in these latter series alone to offset the heavy drop in the other series, which are far more "basic." The missing element is perhaps the accumulation of individual funds in anticipation of the holiday season. Unlike most of the other series, deposits also show a small June peak, which perhaps reflects the accumulation and disbursement of funds for the June and July dividend, interest, and tax payments.

It is still more significant that the "basic" industrial and commercial series themselves do not at all closely resemble the deposits seasonal in their general path and pattern of movement. The closest resemblance appears to be with New York bond sales, by units; then with New York stock sales, first by money volume and then by units sold. On the other hand, from February through October deposits have a generally rising trend; and this is found only in freight cars loaded.[2] It is evident that, if all the seasonals that we have compared with deposits were reduced to the same scale of amplitude and were then averaged together, we should probably come out with something not unlike the small deposits seasonal—exception being made for the June and especially for the December peaks.[3] The several broad measures with which we might expect to find deposits associated each have clearly marked seasonals, but these latter

[1] Some of this December drop may be due to a failure to make sufficient allowance, in the volume series, for the December holidays. But not all of it can be explained in this way, for factory pay rolls are above the average in December (Chart V*a*).

[2] Most of the seasonal in car loadings can in turn be explained by roughly summing the seasonal in industrial production and the familiar fluctuation in agricultural shipments.

[3] It is interesting that factory pay rolls (Chart V*a*) show two lows in January and July; deposits show two lows each a month later; but no comparable lags appear between the peaks. Do the seasonal drops in pay rolls induce the repayment of bank loans, with funds from the sale of goods previously produced?

seasonals nearly offset one another. It is therefore not surprising to find that the deposits seasonal apparently corresponds fairly well to a rough average of all these other seasonals, rather than to any one of them taken alone, and that it is neither large nor (at most points) clearly marked. In further consequence, it seems only natural that the data cast little light on the probable sequence between seasonal changes in deposits and seasonal changes in the other series.

With respect to both sets of seasonal comparisons, the reader may be reminded that the monthly outside-currency and circulating-deposit figures here used involve substantial degrees of estimate and cover relatively short periods. They should therefore not be made to carry too great a weight of either positive or negative argument.

Comparisons of the broad movements through time of currency and deposits with similar movements of other important series, and of their residual cycle-accidental fluctuations, are in some ways more illuminating than the comparisons of seasonals, though in other ways they are less informative.[1] No pretense at an exhaustive study is made

[1] For certain purposes it is also desirable to allow for population changes. Between 1890 and 1930, population doubled, outside currency quadrupled, and circulating deposits increased tenfold. Measured per capita, outside currency doubled, while circulating deposits increased fivefold. The rate of increase per capita was irregular after 1910. 1920 was much above the apparent previous trend, 1930 somewhat below. The indices for the census years, with 1890 as 100, are as follows, per capita for currency and deposits:

Year	Outside Currency	Circulating Deposits	Population[1]
1890	100	100	100
1900	103	139	135
1910	111	209	161
1920	250	434	187
1930	178	453	218

[1] United States with outlying possessions.

here; there are many possibilities that have not been explored at all. Some of the results of these preliminary investigations are rather striking, however, especially for the period since 1919.

On the accompanying Chart VI, outside currency is compared on an annual basis since 1890 with retail food and wholesale prices.[1] The latter are among the few presumably relevant series that go back so far. It is evident that up to the beginning of currency hoarding in 1930–1931, the paths of the three curves are broadly similar in their main movements, though in *relative* terms currency rose much more rapidly from 1897 to 1915, and did not fall nearly so far after 1920. There is no uniform pattern of leads and lags, however, in these annual data. Currency lags behind wholesale prices in 1921–1922, for example, but leads them in 1906–1907, and leads both series in their 1925–1926 downturn. Other leads and lags, if they exist, are not clearly marked. It is interesting to observe that in 1922–1929 the price curves, though much like the currency curve, are completely unlike those for deposits (Charts II and III); and to see how closely, in the main, the two price curves resemble one another.[2]

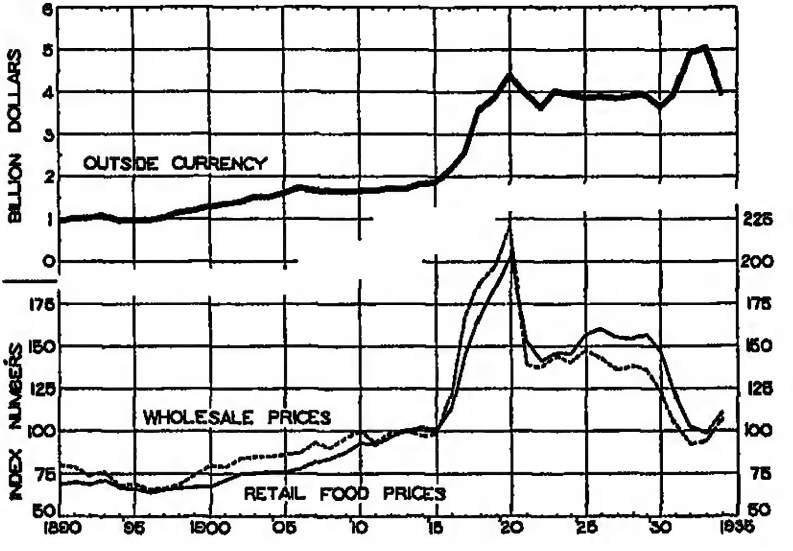
On Chart VII, outside currency is compared on a monthly basis since 1919 with three series previously discussed: retail food prices, department-store sales, and factory pay rolls. All four series are adjusted for seasonals, and computed trends are drawn through the curves for the adjusted data. Because of the extreme hoarding and dishoarding in 1930–

[1] Retail food prices (1913 = 100) and wholesale prices (converted to the same base) are taken from the U.S. Bureau of Labor Statistics. It may be remarked that Professor Douglas's index of wages is almost identical with the retail food price index to 1920; thereafter it holds a higher level, with a somewhat different pattern. See Paul H. Douglas, "Real Wages in the United States" (1930), p. 246.

[2] This raises some interesting problems, which cannot be dealt with here, as to the factors that may be supposed to influence wholesale prices most intimately. One might have expected them to be associated more closely with deposits than with currency.

1934, it seemed better to use the data for currency of small denominations in circulation outside the Treasury and Federal Reserve banks during this period, instead of the

CHART VI.—OUTSIDE CURRENCY, RETAIL FOOD PRICES AND WHOLESALE PRICES, ANNUALLY: 1890–1934



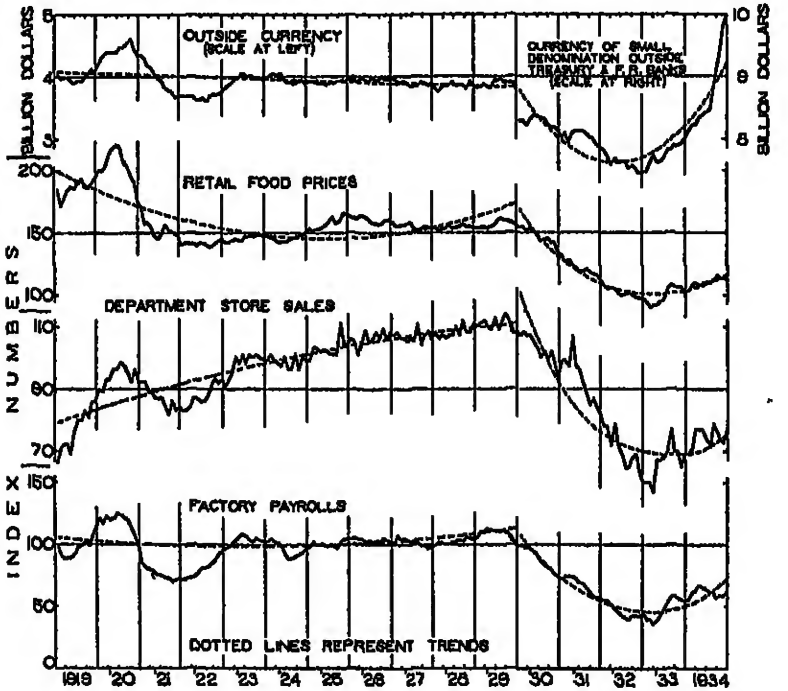
total "outside currency" hitherto employed. This procedure appears to give a more representative picture of currency actually being used for making payments in these years.[1] Note, however, the shift in scale (shown at the right of the chart) which this entails.

[1] The data for outside currency are given in Table II of the Appendix. The sources for the other series were given in a footnote in the preceding section, where their seasonals were discussed. The trends used here and throughout the present volume are computed by the short-cut method described by R. A. Fisher in his "Statistical Methods for Research Workers" (5th ed., 1934), pp. 139–148. Because of the difficulties that Fisher's description presents to students not trained in mathematics, I have given a nonmathematical account of the simple procedures actually involved in Appendix C.

The trends are all broken at the end of 1929. The justification for this procedure, to which some students may object, is also considered later, in connection with the exchange velocity of bank deposits (see Chap. IV, Sec. III). The case for breaking the trends is especially strong for the exchange velocity curves. The general argument, which will not be defended in detail, is that the violent and progressive deflationary and hoarding movement which was manifested after 1929 in all the

The closest resemblance to the currency curve is apparently provided by retail food prices, up to the beginning of currency hoarding in 1931. Currency sometimes seems to

CHART VII.—OUTSIDE CURRENCY AND OTHER SERIES, MONTHLY: 1919–1934



move nearly with food prices, but at other times clearly lags behind, as in 1919, late 1920, and early 1924. The 1924–1925 rise in food prices, however, found almost no counterpart in currency. Department-store sales are also fairly close to the outside-currency curve in their fluctuations, though in 1924–1929 their general path was upward, whereas cur-

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series examined in the present volume was a "new thing," relative to the aggregate period 1919–1934. It was a force or phenomenon with no antecedents definitely perceptible in these data by statistical devices before 1929.

The trends fitted here are all of second or third degree. All trends for 1930–1934, and the trend for the money volume of stock sales in 1919–1929 (Chart IX), were fitted to the logarithms of the data because of the great amplitudes of fluctuation encountered in the original series.

rency was declining. Their temporary rise early in 1931 should also be observed. They clearly lead currency only in 1922. Factory pay rolls are unlike currency or the other series in their amplitude of fluctuation, but resemble currency and prices in their main movements. Pay rolls seem quite clearly to lead currency from 1919 through 1923, and again at the end of 1929. A lead can perhaps also be postulated in 1927–1928. The lead of pay rolls over the other two series is less clear.

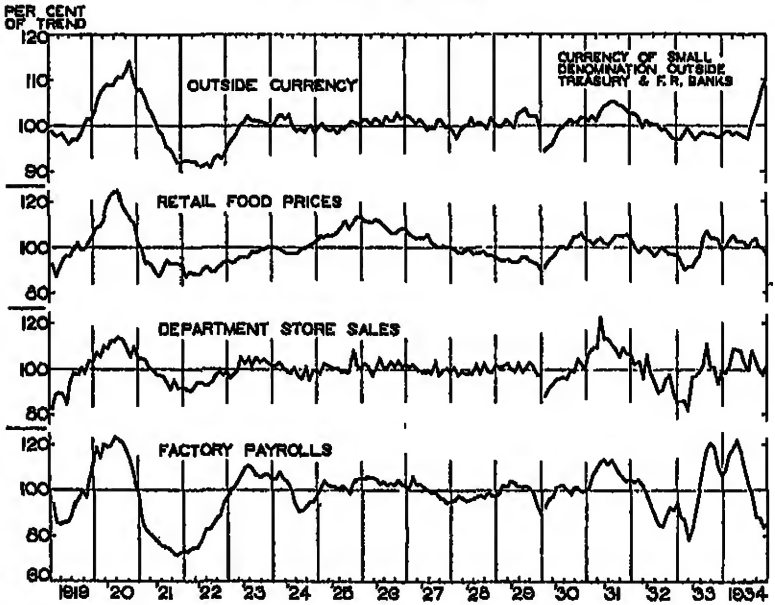
A more concise if more limited picture is given by Chart VIII, which shows the "cycle-accidental" fluctuations of the several series; these are the quotients obtained when the original data adjusted for seasonals are divided by the computed trends. The significance of these cycle-accidentals, however, is necessarily open to question.[1] It will be recalled that the general problems involved were discussed briefly in the preceding section. If the trends used in obtaining the cycle-accidentals given on Chart VIII could be defended with some assurance, as simple generalizations themselves having meaning in terms of known forces and operational relations, we should stand on fairly firm ground. The residual quantities remaining after removal of trends of this sort would then have some claim to be viewed as authentic measures of the combined cyclical, accidental, or other forces

[1] The term "cycle-accidental" perhaps requires some explanation and even apology. It is used to emphasize the fact that, at least in these currency and deposit data, the "accidental" element in the residuals remaining after division by the trend may be of at least the same general order of importance as any genuinely "cyclical" element. An "accidental" deviation in the data is any deviation not accounted for in terms of the one or more generalized explanations of the movements of the data, which, in each given case, may have been set up and applied to the data as a whole (*e.g.*, seasonal fluctuations, trends, etc.). Thus the term is used as virtually synonomous with "unclassified" or "unexplained" or, in Professor Mitchell's phrasing, "random."

The cycle-accidental residuals have not been expressed in terms of standard-deviation units, partly because the gain seemed unlikely to compensate the labor, but chiefly because the significance of the standard deviation itself, for time series which cover so relatively short a period as these yet which fluctuate so widely, must be open to serious question.

working to vary the original data around their central tendency. In the present case, however, no such defense can be given for the computed trends. The total period examined is short, the original data fluctuate widely, and the trends themselves are merely simple statistical generalizations for

CHART VIII.—CYCLE-ACCIDENTALS OF OUTSIDE CURRENCY AND OF OTHER SERIES, MONTHLY: 1919–1934



two subperiods that seem to have rather different characteristics. A change in the terminal years of the periods, or even in the degree of the trends, would in some cases alter substantially the trends themselves, and would therefore also alter the pattern of the residual cycle-accidental fluctuations. A broader defense of these trends, as generalizations of powerful underlying forces of fairly well-established character, cannot be made with any assurance.

It follows that the cycle-accidental curves presented on the accompanying charts must be treated with a good deal of reserve. Nevertheless, they suggest conclusions

which are in the main consistent with those already reached. This fact presumably increases the weight that may be attached to them.

It is striking that, from 1923 to the middle of 1934, the fluctuations of the outside-currency cycle-accidentals are extremely small. This suggests that "accidental" rather than genuinely "cyclical" factors were chiefly in play in this period. The 1934 rise can perhaps be interpreted as merely the result of the return flow of hoarded currency to the banks, for in 1930–1934 a part of bank-vault cash is unavoidably included in the currency data. The currency curve shows a definite resemblance to retail food prices in 1919–1923, with a lag of several months, and again from 1930 to the beginning of 1933. In 1924–1929 its movements are not closely analogous, and are much smaller in amplitude.[1] It also has a fairly close relation through 1932 with department-store sales, though with much smaller fluctuations after 1922 (note that the scales of the two curves are not equal). It likewise shows a lag, but one which is apparently less than its lag behind food prices. The measurement of lags is difficult because of the absence of sharply defined turning points in currency, except in 1920. Substantially the same things are true of the relation between currency and factory pay rolls. Finally, even a brief inspection of the curves given on Chart X indicates that the outside-currency cycle-accidentals are *not* closely related to the corresponding elements in circulating deposits, or in the broad measures of production, wholesale exchange, and financial activity—save that they all rose and fell in 1919–1922, and all fell at the end of 1929.

If we now combine the results of these comparisons of seasonal, cycle-accidental, and trend factors and of the

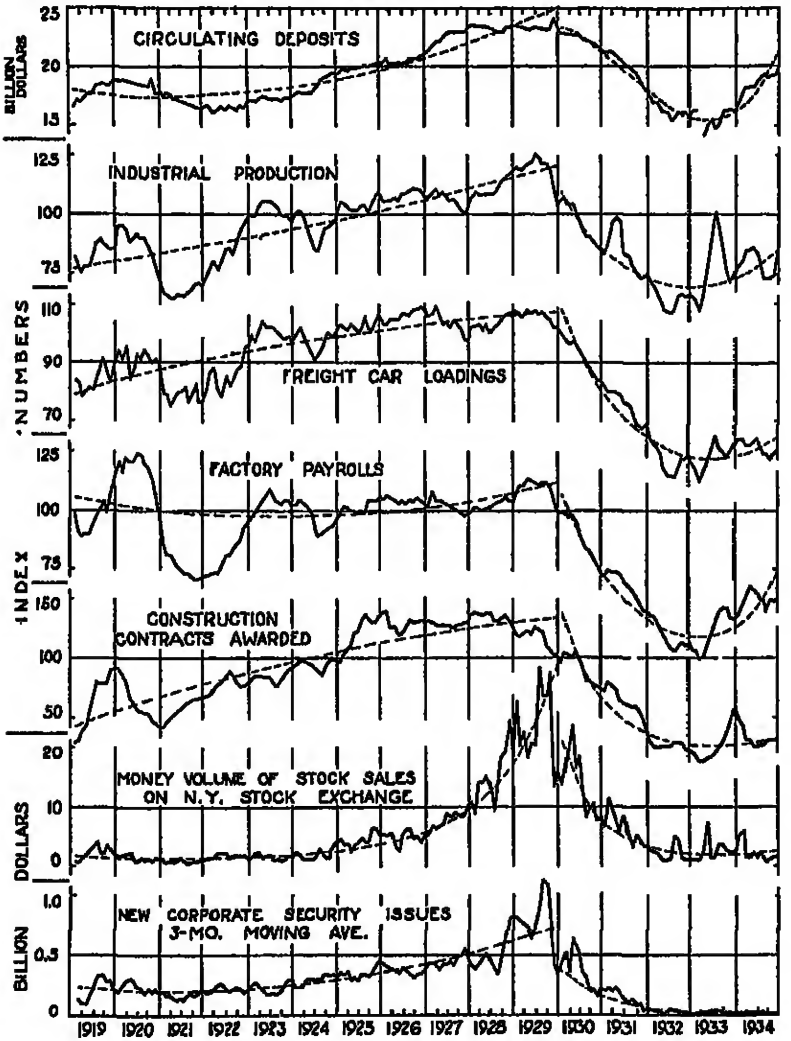
[1] The relation between outside currency and wholesale prices, with respect to these cycle-accidentals, appears to be quite slight after 1921. The wholesale price curve is therefore not given here, nor were its cycle-accidentals computed.

general paths of movement of the curves, one broad conclusion emerges fairly clearly. Outside currency is closely associated with the measures of individual income and retail expenditure used here, but not with the volume of production or of wholesale or financial activity. This is, of course, plausible. Some further inferences that are perhaps more debatable are as follows: First, the comparison of seasonals suggests that, with respect to time periods of say one or two months, changes in outside currency are more closely associated with changes in retail expenditures than with changes in individual incomes, as measured by industrial wage earners' incomes.[1] Second, with respect to the relations over somewhat longer periods and at major turning points, outside currency is closely associated with both individual incomes and individual expenditures, and lags behind both by perhaps three months or more at most points. The lag behind department-store sales and factory pay rolls is apparently less than that behind retail food prices. Third, from these two inferences one is tempted to deduce that, while the most plausible main "sequence of changes" runs from incomes to currency to retail expenditures, there are substantial variations in the absolute and relative quantity of currency that people keep on hand, as well as variations in its average turnover or exchange velocity. If incomes fall, expenditures fall too, but currency falls only with a lag; individual consumers and perhaps retail dealers draw down previous currency hoards rather slowly. If incomes rise, expenditures rise too, but again currency rises only with a lag; hoards are rebuilt rather slowly. During the intervals before the currency changes are completed, the average exchange velocity of the total stock of outside currency must therefore fall substantially in the first case and rise in the second. These latter proposi-

[1] There is also some indication that seasonal currency hoarding in anticipation of Christmas expenditures begins some months ahead.

tions, however, are inferences that do not rest on very firm ground.

CHART IX.—CIRCULATING DEPOSITS AND OTHER SERIES, MONTHLY: 1919–1934



On Chart IX similar comparisons of computed trends and general paths of movement, based on monthly data, are made between circulating deposits and various other

series since 1919. These comparisons are more satisfying than the analogous ones for outside currency, in that circulating deposits do not show the inertia manifest in currency between 1923 and 1930 and do not shoot up in the depression years. The deposits curve hence gives a rather more realistic picture of general economic activity since the war than does the currency curve. All of the series are adjusted for seasonal, and computed trends are drawn through each.[1]

The curve for circulating deposits looks in general most nearly like the curve for freight-car loadings, though the resemblance is not very close. Deposits do not reflect the 1924 drop in loadings, and they show little or none of the 1923 peak and the 1927–1928 drop. Loadings lead deposits in 1921–1922 and in 1929. Industrial production resembles car loadings much more closely than it does deposits with respect to its fluctuations (though its 1929 peak, in absolute

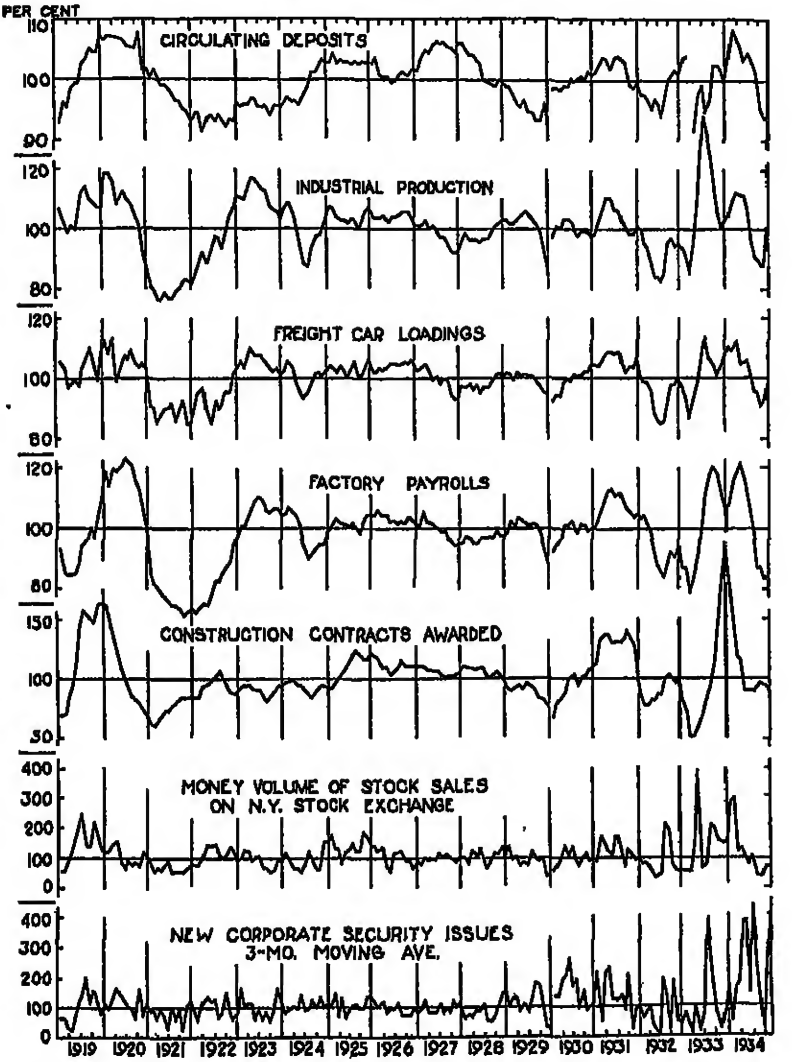
[1] The data for circulating deposits are given in Table II of the Appendix. Sources of the data on car loadings, industrial production, and factory pay rolls were given in a footnote (p. 35). Construction contracts awarded are the F. W. Dodge Company estimates, as seasonally corrected by the Federal Reserve Board. Net new security issues are from the *Commercial and Financial Chronicle*. The estimated money volume of stock sales on the New York Stock Exchange is obtained by multiplying the number of shares sold per month (from the *Commercial and Financial Chronicle*) by the *New York Times* index of stock prices in dollars (monthly averages of daily figures). This index is defective, since it is composed of only 50 stocks, half of which are rails and nearly all of which used to be "high grade"; it is presumably unrepresentatively high through most of its course. It is the best dollar index available, however, and it moves in sufficient consistency with the Standard Statistics relative index to be usable for the present rough comparisons.

In connection with this estimated money volume of stock sales, it must be remembered that only a small—and variable—proportion of stock sales gives rise to bank debits, thus tying up deposits. After experimentation, it seemed of doubtful value to estimate these latter debits; the curve obtained for samples over short periods of time fluctuated fairly closely with the curve for estimated money volume of stock sales, which is easier to compute.

The trends shown on Chart IX are computed by the method referred to in a footnote accompanying Chart VII, and described in Appendix C. As explained in connection with Chart VII, the trends are broken at the end of 1929. This might seem unnecessary in the case of deposits; but for them a continuous trend giving a good fit would have to be of a degree too high to be itself accounted for easily.

terms, is much higher than the car-loadings peak; note the differences in the scales of the several curves). Its general

CHART X.—CYCLE-ACCIDENTALS OF CIRCULATING DEPOSITS AND OF OTHER SERIES, MONTHLY: 1919–1934



trend is closer to the deposits trend than that for car loadings. It has no clear lead over car loadings, except in 1920, and it

shows the same leads over deposits as the loadings curve. Factory pay rolls show nearly the same fluctuations as production, with several months' lag behind production in 1920, 1921, perhaps 1929, and the end of 1933. But their high for the period was reached in 1920, not in 1929, and their trend from 1923 to 1929 was flatter. The effect of the 1933 "inflation boom" on both pay rolls and production should be observed; the effect on car loadings was much smaller. Finally, in this group of industrial and commercial series, construction contracts awarded evidently have a substantially different pattern from the others, both in shape of trend and in timing of fluctuations. They move with production in 1920 and 1921, lack the 1923 peak, have a 1925–1926 peak not shown in the other series, and turn down in 1928, a year before the others. The 1933–1934 construction peak lags several months behind that in production.

The curve for the money volume of stock sales on the New York Stock Exchange, it will be recalled, is itself an estimate (but with seasonal adjustment); it is best regarded as an index of relative change, not as an actual measure of absolute quantities. It is interesting here chiefly for its *lack* of close correspondence with the other curves shown, either in trend pattern or in fluctuations. Stock transactions probably contribute appreciably to the total size of circulating deposits, and it will be recalled that they have a rather similar seasonal movement (Chart V*b*), but it is hard to assign them any great causal importance in the larger movements of deposits. Substantially the same things hold for new security issues, which resemble the stock sales curve much more closely than they do any of the others.[1]

[1] It will be recalled from Charts III and VI that after 1921 the deposits curve is completely unlike those for retail food and wholesale prices. Indeed, reference to Chart III shows that the general path of movement of circulating deposits was different from that of prices in nearly the whole period 1890–1929, except in the war and postwar era. In 1890–1915 some of the year-to-year fluctuations were similar,

These relations are brought out somewhat more sharply by the accompanying Chart X, which shows the cycle-accidental components of the series (quotients obtained by dividing the original data, seasonally adjusted, by the computed trends). The reader will recall the cautionary remarks made above concerning the significance of the cycle-accidental factors computed in examining outside currency, and concerning the weight that can be attached to them. The same observations apply here and need not be repeated.

The features of Chart X that are most striking are the extremely close association at most points between the cycle-accidental fluctuations of industrial production and factory pay rolls (with production usually showing a slight lead), and the almost equally close association of production and car loadings (with no lead), after allowance for the smaller amplitude of the latter. Construction contracts awarded resemble industrial production around the larger turning points, with some tendency to lead (except in 1933), but many of their shorter fluctuations are markedly dissimilar. Department-store sales, it may be observed (compare Chart VIII), offer a damped-down and not very accurate reflection of industrial production, and hence also of pay rolls and car loadings. The estimated money volume of stock sales and new security issues—both of which have much greater amplitudes of fluctuation—do not closely resemble any of the other curves, except for the 1920–1921 and 1929–1930 drops and the 1933 peak.

When we turn to the curve for circulating deposits, the most conspicuous thing about it is its lack of a close and consistent relationship with any one of the other series presented.[1] The lack is more marked for these cycle-accidental

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but not all, and the apparent trends were different in both slope and curvature (Account must be taken of the differences in scale of the several curves.)

[1] Note that the relative amplitude of the deposit cycle-accidentals is much less than those of the other curves. The apparent 1928–1929 drop is somewhat uncertain;

fluctuations than for the trends and general paths of movement previously examined. In 1919–1921, 1929–1932, and 1934, it is true, deposits move broadly with industrial production (with a substantial lag in the first period), but at other points their movements are quite different in the main, and from 1922 to the middle of 1929 are apparently inverse. The same type of thing is broadly true of the relations between deposits and the other curves. Yet the deposit curve is not merely a wandering lost star. Almost every one of the larger movements of the deposit-cycle curve can be related to an analogous movement of one or more of the other curves. This again suggests, what is plausible enough, that deposits move with some sort of aggregate of these and other series.

Finally, comparison with Chart VIII shows that in 1923–1929 and in 1933–1934 the cycle-accidentals of outside currency and of circulating deposits had little relation to each other. However, in 1919–1922 and from 1930 to mid-1932 they rose and fell roughly together.

A study of the seasonal, cycle-accidental, and trend components of circulating deposits and of their general path of movement thus does not give a clear-cut picture of the factors influencing deposits. This negative or at least inconclusive result is itself significant. Circulating deposits appear to be relatively sluggish in their movements, which is indeed a natural consequence of the wide variety of forces that presumably affect them. At major turning points they lag behind such things as industrial production, car loadings, construction, and pay rolls. This suggests that at such turning points (or periods), as in the case of outside currency, there are probably substantial variations in the relative quantity of deposits which individuals and firms keep by

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fitting a trend of perhaps the fifth or sixth degree would smooth down much of the 1926–1929 fluctuation.

them, and hence in the exchange velocity of such deposits.[1] But between these major turning points it does not appear that the movements of circulating deposits are consistently associated with any other one factor or group of factors. Their lack of any close relation to wholesale prices is particularly noteworthy.

It would therefore be extremely hazardous to try to formulate, on the basis of the above data, a standard "sequence of events" with respect to the changes in circulating deposits. The task is rendered all the more difficult by the fact that a large proportion of deposits arises, in the proximate sense, from bank-investment operations rather than from bank loans. The connection between bank investments on the one side and industrial production, car loadings, and the like on the other cannot be supposed to be very intimate.[2] About all that can safely be said is that circulating deposits apparently move roughly with, and a little after rather than a little before, some sort of hypothetical summation or average of other broad measures of the volume of economic activity; and that in comparison with the fluctuations of any one of these other measures, they are relatively sluggish over short periods (periods up to a year or even more in length).

Finally, when these propositions are considered in conjunction with those derived a few pages above from the outside-currency comparisons, it becomes even clearer than

[1] Compare Chart XVIII in Chap. IV. In 1922–1923 industrial production rose cyclically, circulating deposits remained relatively low, and the exchange velocity of these deposits (140 outside cities) rose, though sluggishly. In 1923–1924 production fell, deposits rose, and velocity fell. This relation is not maintained with sufficient consistency, however, to be given much weight in interpreting the cycle-accidentals. (Deposits times velocity is, of course, simply the total money volume of transactions conducted with deposits.)

[2] Also see Chart XXVII in the Appendix for the relation between circulating deposits and "all other" loans; the latter presumably reflect primarily industrial and commercial lending. The relation is not very close, and there is some indication that "other" loans lag rather than lead.

before that—as previously remarked—no very close and necessary connection can be expected to prevail between outside currency and circulating deposits. The proximate factors that ought logically to produce the greatest influence, and the statistical series that show the closest degrees of apparent association, are quite different for outside currency from what they are for deposits. Outside currency moves chiefly with or after such things as factory pay rolls, on the one side, and retail expenditures on the other. On the other hand, circulating deposits vary in the first instance chiefly because banks change the volume of their loans and investments. They are most closely associated statistically, among the series examined above, with such things as industrial production and car loadings. Changes in circulating deposits and changes in outside currency therefore have a "common antecedent cause" in the movements of general economic activity. The two magnitudes are related at intervals, too, by the effect of inflows or outflows of currency on bank reserves and hence on bank lending and investing activities. They are likewise related over time by the fact that in actuality the American population apparently does attempt, *in given short periods, to keep only a certain proportion of* its total media of exchange in the form of currency. The proportion shifts, but it shifts relatively gradually. None of these connections between deposits and currency is very tight or rigid, however, and none of them could be expected to produce a direct and one-for-one "causal" linkage between the two. Indeed, the whole period from 1923 to 1929 is a conclusive refutation of the contention that any large increase in deposits *must* evoke something like an equivalent increase in currency. The similar evidence of a period such as 1908–1913 is almost equally decisive. Decreases in currency and deposits have been more nearly synchronous,[1]

[1] For the period 1930–1933 it is necessary, in making such comparisons, to allow for abnormal hoarding; this allowance was attempted on Chart VII.

but again it is clear that neither set of decreases was the immediate cause of the other. In largest part, both were products of the common antecedent factor, declines in general economic activity.

V. SUMMARY

The principal results of this study of the currency-deposits relation can be stated briefly, if somewhat loosely, as follows:[1]

1. The quantity of outside currency, at the beginning of pronounced currency hoarding in 1931, was nearly four times as large as in 1890. It had increased in a series of relatively sharp slopes, however, followed by rather long and nearly horizontal platforms. Hence the concept of cyclical fluctuations around a simple (low-degree) trend seems inapplicable to the pattern of the main movements of outside currency in the period 1890–1930. The monthly data since 1919 also show a clearly marked seasonal fluctuation. Outside currency moves in close relation to measures of retail expenditures and of small individual incomes in industry, but at major turning points it moves simultaneously or with a slight lag, not with a lead. It also seems to reach peaks somewhat later than the points at which deposits and such broad indices of current activity as

[1] The reader may be reminded that the currency and deposits figures presented are themselves estimates, of varying degrees of presumptive reliability and representativeness. Conclusions from them must be drawn with corresponding care and cannot be given unlimited weight.

Attention should also be called to the large differences in certain years between our estimates for circulating deposits since 1919 and those made by Dr. Lauchlin Currie, in his "Supply and Control of Money in the United States" (1934). The sources of the differences are considered briefly in the notes to Tables I and II in the Appendix. The main difference lies in the treatment of unclassified deposits. It is striking that two methods of estimate, each of which I believe is defensible (though I think the one we have used here is somewhat more accurate), should yield such dissimilar results. The conclusion to be drawn from the dissimilarity, for present purposes, is simply that the data now available cannot be made to carry a heavy weight of *detailed* argument. As to the broader movements of the data and their significance, there is less room for doubt.

industrial production and car loadings have begun to turn downward, and it seems to reach bottom after they have begun to turn up.

2. Both total and circulating deposits increased much more rapidly than outside currency in the period 1890–1930. Roughly, the quantity of circulating deposits in 1930 was ten times as large as in 1890. The movements of both classes of deposits show three distinct periods: 1890 to 1914 or 1915, 1915 to 1929, and 1930 to 1934. As with outside currency, the data for circulating deposits do not unequivocally show the existence of genuine "cycles," but the case here is admittedly less clear. The data also show a small seasonal fluctuation in deposits, but it is complex, and not sharply marked in absolute terms. Circulating deposits appear to move roughly with, and usually a little behind, the general average of such broad measures of the volume of economic activity as industrial production, car loadings, factory pay rolls, and security transactions, but not with any one of them taken alone, nor with commodity prices. The amplitude of fluctuation of circulating deposits is much less than that of the other series in periods up to one or two years, so that deposits appear to be relatively "sluggish." For the total period since 1919, however, the aggregate ranges of variation are more nearly equivalent.

3. The ratios between currency and both classes of deposits show a persistent downward movement from 1890 to 1934, which was seriously interrupted only by the war-time rise and by the currency hoarding of 1930–1933. Neither ratio shows anything that can be described with assurance as cyclical movements; this seems natural enough, in view of our failure to detect unmistakable cycles in any of the three component series. In 1919–1930 the monthly ratio based on circulating deposits also gives some evidence, like outside currency, of reaching peaks shortly *after* other broad indices of economic activity have begun to decline;

the converse is true with respect to its valleys. It shows a seasonal fluctuation that is dominated by the seasonal in outside currency.

4. None of the data considered offers evidence of a direct causal connection between currency and deposits. Rather, the connection between them presumably runs through the antecedent "common causes," loosely summarized in the phrase "general economic activity," which appear to influence currency less quickly than deposits. But neither currency nor deposits are among the first things to move when general activity is beginning to change. The inference that there is no close connection between the two is also supported by a consideration of the different sets of factors which in the immediate sense presumably induce the bulk of the changes in currency and deposits, namely, changes in pay rolls, other small individual incomes, and retail expenditures on the one side, and changes in the volume of bank assets on the other. A loose connection between currency and deposits is produced, however, by the very fact that the money habits of the country are apparently such as to maintain a fairly stable proportion between the two quantities (not a proportion which is constant, but one which over time changes at a gradual and fairly steady rate, except during such presumably abnormal periods as the war and 1931–1934); and by the fact that at times flows of currency into or out of banks alter bank reserves and thus influence the deposit-creation policies of the banks. This latter factor was of course much more important before the passage of the Federal Reserve Act than in the 1920's, but it again played a major role in the events of 1931–1934.

5. Any general monetary theory, or any plan for monetary control, which involves the premise that the currency-deposit ratio is substantially constant in either short periods or long is to that extent running counter to the apparent

facts. It would be possible, for the use of monetary theorists, of central-control authorities, and even of individual commercial bankers, to extrapolate the past downward long-term trend of the ratio, with appropriate qualifications for seasonal and cyclical fluctuations, so far as these are thought to be reasonably well established. Nothing would be added to the present study, however, by attempting this necessarily hazardous extrapolation here. It is enough to demonstrate the erroneousness of the assumption that the ratio is constant.

6. It is also highly significant, both for monetary theory and for monetary control, that outside currency and circulating deposits alike tend to move with or after, but apparently never *before*, the several broad indices of production, trade, and the like, to which they seem statistically and logically most nearly related. The conclusion cannot fairly be drawn from this, however, that the quantity of money is a purely passive factor in business activity. A substantial argument can be made for the view that, while the proximate initiating factor in a period of general upward movement, for example, is perhaps an increase in business activity itself, the subsequent expansion of (particularly) deposits, which our type of banking system permits and usually encourages, will in turn support or even induce a further increase in business activity. A rising spiral of mutually aggravating actions and reactions may thus be set up, which may persist for a considerable time. The data presented above are consistent with this hypothesis, though they do not adequately test it.

7. The data examined in this chapter also have a bearing on the current proposals, some primarily political but some more seriously scientific, for "reflation," "inflation," and the like. It is true that, if the quantity of currency and deposits were increased overnight by 50 or 100 per cent, with further increases in prospect, something spectacular would happen. Prices would certainly rise, and we might

even start on the path that Germany followed after the war. With respect to less drastic increases that are spread over some time, the outcome is not so assured. Deposits have moved in the past with or after, not before, the broad measures of business activity examined here; and there is apparently no close relation at all between the quantity of deposits and the levels of prices. Currency in circulation similarly moved with or after individual incomes and expenditures, so far as they were tested, not before them, and with or after prices, not before them. The data thus provide no prima facie support at all for the view that increasing the quantity of money will start the process of economic recovery. On the contrary, increases in the quantity of money seem to have been the *result* rather than the cause of the onset of business revival. In actuality, of course, data of these kinds cannot be taken as a "proof" of causation one way or the other. It is equally true that they do not "prove" that further deliberately inflationary measures in this country will *fail* to raise prices or to stimulate business. The various groups of facts examined in the present chapter, however, strongly suggest that enforcing substantial increases in the quantity of currency or deposits *in advance* of increases in business activity, by whatever means, is not likely to be an effective method for influencing general economic activity in desirable ways or, more particularly, for bringing about a sound general economic recovery.

Chapter III

SOME REGIONAL COMPARISONS AND INTERREGIONAL RELATIONS

I. PROBLEMS AND DIFFICULTIES

THE preceding chapter was concerned with the behavior of the national aggregates of currency and deposits. It is a matter of familiar observation, however, that the various geographic and functional components of these national aggregates do not always move in the same ways and at the same times, and that on occasion some of the components may move in quite opposite directions. Agriculture does not fluctuate closely with industry, nor construction with the production of retail goods; the behavior of the southwestern banks follows materially different patterns from those found in New England; and so through an extensive series of possible comparisons. No matter what the angle from which they are viewed, in most respects the national aggregates are far from being homogeneous entities. It follows that, when we deal with them, we are dealing with either averages or summations, which may be quite unrepresentative in many important characteristics of any one of the components treated separately.

It is therefore of substantial interest and significance to take some few steps toward breaking down the national aggregates into their larger constituents. In the present study we shall make a division only into large geographical regions, using for this purpose the twelve Federal Reserve districts and confining the data to the Federal Reserve

member banks.[1] Since the importance of member banks relative to nonmember banks has shifted from time to time, and has presumably shifted in different ways within different districts, this sample is far from being entirely satisfactory. There is no present way of getting a better district sample, however, without a great deal of labor. Moreover, the sample is large—on the average, it is roughly two-thirds of the total—and the evidence available suggests that in most cases the shifts just referred to have not seriously distorted the data.

Two major problems were originally proposed for this investigation. First, have the several districts shifted through time in relative banking importance (chiefly as measured by volume of deposits subject to check), or have they kept substantially the same relative positions; and, in either case, why? Second, do the several districts respond uniformly and synchronously to large disturbances; and, whether the answer is yes or no, what is the process by which interdistrict adjustments are effected?

The first part of the first question can be answered fairly easily and in the affirmative, as will be shown presently, but the second part cannot be answered definitely without utilizing a good deal more information than could be put together for the present study. The second main question, when it is examined carefully, proves to be much more complex than the first, and one for which it is hard to establish any definitive answers at all. It is difficult to define a "disturbance" in terms of what has actually been the course of events since the war, or to isolate the effects of one disturb-

[1] Several other studies of various aspects of the interdistrict problem, particularly interdistrict flows of funds, have already been made and are familiar to all students. See especially the studies in B. H. Beckhart (editor and joint author), "The New York Money Market" (1931–1932), and S. E. Harris, "Twenty Years of Federal Reserve Policy" (1933). For a study of the differences in banking behavior of the several regions, see Allyn A. Young, "An Analysis of Bank Statistics for the United States" (1928), pp. 37–51; this relates, however, to National Banks alone.

ance from those of another, or to distinguish a "temporary maladjustment" from an incipient "enduring shift in relative importance." It is still more difficult to get satisfactory evidence on the character and speed of the interdistrict adjustment processes. We shall not be able to do much more than make suggestions for the solution of the problems here involved. Their great importance to an understanding of the monetary and general economic relations prevailing between different parts of the country, however, and the fact that rather little attention has hitherto been paid to them, make it seem permissible to present incomplete results.

II. SHIFTS IN THE RELATIVE IMPORTANCE OF THE RESERVE DISTRICTS

The "relative banking importance" of the several Federal Reserve districts can be gauged in several ways. Total deposits can be compared, or circulating deposits as defined at earlier points, or various categories of assets, or reserves, or—perhaps most significant of all for some purposes—debits to individual accounts. Total deposits and total assets will tell nearly the same story, since the banks' own capital is a comparatively small and stable item. The relative sizes of circulating deposits will agree with the relative sizes of total deposits only if the proportion of time and savings deposits to total deposits is the same in the several districts. Actually, of course, these proportions are different, and they also vary from time to time. The relative sizes of reserves are likewise affected by differences in this proportion. In addition, they are affected by the geographic location within each district of the "average" district bank (which determines the average reserve requirement against demand deposits) and by the presence of reserve surpluses or deficiencies. Because of wide differences in exchange velocity in different types of economic activity, debits are likely to give a picture

still farther removed from those yielded by the other items.

In some ways the most satisfactory basis of comparison is the relative size of reserves, after adjustment has been made for the varying proportion of time and savings deposits, and this basis has been utilized at certain points in the present study. There must always be some question, however, as to the significance of these adjusted reserves in terms of the actual supply of "money," and in terms of actual banking operations. At the outset we shall therefore use, in slightly rougher form statistically, the "circulating deposits" (for member banks only) discussed in the preceding chapter. The volume of circulating deposits presumably reflects the money-using operations of each district rather more closely than do total deposits. Circulating deposits exclude, of course, bankers' balances, exchanges, and other duplications as far as possible.

On the accompanying Chart XI are presented semiannual district relative figures for circulating deposits of member banks from 1919 to 1934, on the June and December call dates. These district relatives, which are percentages, are obtained by dividing the circulating deposits for each district by the national aggregate of circulating deposits at each date. For any one date, the sum of the twelve district deposit relatives is 100. The use of such relatives has certain serious statistical and logical defects, but it also has the great advantage that the relatives eliminate all trends, cyclical, seasonal, and other factors of change that are common to the country as a whole. The relatives also wipe out the effect of changes in merely absolute magnitudes. They leave only those movements that represent the departure of each district from the national average. In view of the enormous changes in absolute size of the deposit figures during the years here in question, some such rather drastic procedure is essential if any progress at all is to be made toward esti-

mating the shifts in the *relative* importance of the several districts.[1]

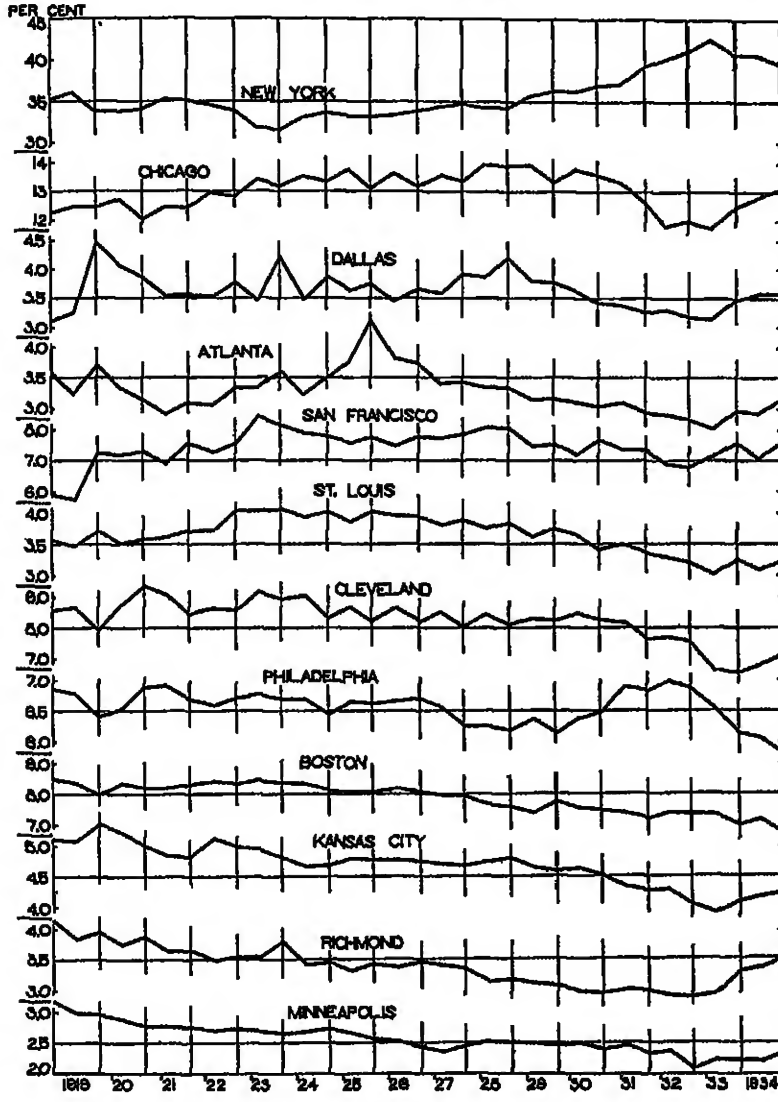
The chart makes it clear that the several Reserve districts shifted their relative importance very substantially from 1919 to 1934, and in accordance with quite different patterns. The national aggregate of circulating deposits was therefore far from homogeneous in the movements of its major geographic components.

New York, which on the basis of circulating deposits is roughly three times as large as any other district, also shows a very wide range of movement. The relative importance of New York declined from 1919 to the end of 1923, which was not markedly true of any other district, but it then rose persistently until 1933—which again was not true of any other district. That is (compare Chart IV), in absolute terms New York deposits increased *less rapidly* than the national average in 1919–1920 and in 1922–1923, fell more rapidly in 1920–1921, rose much more rapidly in 1924–1929, and fell less rapidly in 1930–1932. It seems probable that the persistent rise in the New York deposit relatives from 1924 to 1929 was produced in considerable part by the growing attraction of the New York call money and stock markets for interior funds. The continuance of the rise to 1933 presumably reflects the attempt of interior districts to find safety, as the tide of interior bank failures began to mount.[2] In terms of the larger shifts in relative importance, the New York district was completely unlike the rest of the

[1] The data are given in Table IV of the Appendix, where their construction is also explained. The districts are charted, not in the order of absolute size, but according to whether the general rift (dstraight-line trend) of their respective deposit relatives was rising, roughly constant, or falling. The scales of the several curves should be examined carefully. They are selected so as to give the total fluctuations of the curves roughly equal visual amplitudes.

[2] This rise is from one point of view exaggerated by the chart, since the data do *not* include bankers' balances; the withdrawals of these balances from New York were very heavy in the latter part of 1932, and especially in January and February, 1933.

CHART XI.—DISTRICT DEPOSIT RELATIVES (CIRCULATING DEPOSITS), SEMI-ANNUALLY: 1919–1934



country.[1] This fact is of substantial importance in a number of connections.

Chicago, the next largest district, shows a persistent gain in relative importance to 1929–1930. Its subsequent sharp decline in 1931–1932 is presumably due chiefly to the flight of funds to New York for safety, already referred to. Dallas alone of all the districts reveals a very nearly horizontal trend for most of the period with the exception of 1931–1933, with moderate peaks at the ends of 1919, 1923, and 1928. In terms of the national average, Dallas has been much the stablest district in the country. Atlanta reached its peak for the period at the end of 1925, and then declined steadily to 1934. San Francisco, after rising sharply to 1923, also declined steadily to 1934; St. Louis followed a similar pattern, but with less abrupt changes; Cleveland reached its peak at the end of 1920. The last five districts—Philadelphia, Boston, Kansas City, Richmond, and Minneapolis—show a remarkably uniform declining trend throughout virtually the whole period to 1934, except that Philadelphia seems, like New York, to have received interior funds seeking safety after 1929. It is striking that, of the six districts with trends which decline persistently after 1920, three are predominantly agricultural but three are industrial. The difficulties of agriculture clearly do not account for all the declines. Nor can these trends be explained solely in terms of the flight of funds away from districts with imperiled banks. The declines began, in most cases, before bank failures had become a serious problem in the public consciousness, and two of the districts in question—Philadelphia and Boston—were comparatively free from banking difficulties until 1932–1933.

The period covered by these data is too short to cast much light on what we may call differential district cycles—

[1] It is also true, but of no significance, that the New York curve is the inverse of the aggregate curve for the rest of the country; this is likewise true for every other district, when it is taken separately and compared with the rest of the country as a whole.

that is, cyclical departures of given districts from the national average. "Cycles" of a sort can be picked out on most of the curves; but sufficient information is not at hand to indicate whether these apparent cycles are significant in terms of the movements of general economic factors outside the banking field. The only district for which two or more cycles can be clearly distinguished in this rather short period is Dallas. Moreover, the logical problem of interpreting such cycles is a difficult one, since the data for which the cycles are postulated are themselves relatives—that is, are percentages of a national total. An apparent cyclical rise in a given district might therefore reflect an actual absolute stability of deposits in that district, but a stability accompanied by an absolute cyclical decline in other districts.[1]

The curves also cast an interesting light, so far as semi-annual data are usable at all for this purpose, on the apparent differences in seasonal behavior of the several districts. Atlanta, Dallas, Kansas City (not sharply defined), Richmond, San Francisco, and St. Louis are relatively low in June and high in December; in the main, these are agricultural districts. Chicago, Cleveland, Boston, Philadelphia, and Minneapolis are relatively high in June and low in December, though for the last three the movement is not sharply defined. The first four are predominantly industrial districts. New York, interestingly enough, does not fall unequivocally in either category. To 1923 it is relatively high in June, but thereafter, except in 1933, it is usually high in December. The latter pattern is perhaps associated with the growing importance of the New York call money and stock markets. The physical quantity of New York security transactions, as pointed out in Chapter II (Chart V*b*), is seasonally high in December. The fact that the data cover only two dates in each year, however, makes these observa-

[1] Also see the more general discussion of the problem of cycles and trends in the preceding chapter, Sec. III.

tions on relative seasonals highly tentative. Attention should also be drawn again to the logical difficulties, remarked in the preceding paragraph, in interpreting differential district movements.[1]

The curves on Chart XI thus permit us to give preliminary answers to at least parts of the two major questions raised in the preceding section. First, the several districts have shifted very substantially in relative banking importance since the war. Only Dallas has come close to maintaining a constant relative position. Speaking broadly, from 1923 to 1929 most of the other districts lost ground to New York in relative terms, and in much lesser degree to Chicago. In 1930–1933 all the others again lost ground to New York and, in lesser degree and temporarily, to Philadelphia. Second, the chart casts some light on the question of whether large "disturbances" originating in any one district are diffused fairly uniformly and synchronously to other districts. If the answer were in the affirmative, of course, such disturbances would leave the deposit *relatives* of the several districts substantially unchanged, unless temporarily, since their *absolute* deposit figures would change in equal proportions. Now it is true that each curve reveals an arrangement of peaks, valleys, and gradual slopes which is not closely paralleled by that of any other curve. To this extent, the hypothesis of fairly even diffusion must be rejected. But the lower six or eight curves on the chart show, with one or two exceptions, quite strikingly similar general downward movements from about 1923 to 1933 or even 1934. In view of the tremendous expansion and subsequent contraction of the national deposit total, the large imports and exports of gold, and similar major changes that were going on in the years after 1922, it seems reasonable to

[1] Also see the studies of the seasonal behavior of the *absolute* district net demand deposit figures, by James G. Smith, in B. H. Beckhart, "The New York Money Market," Vol. IV (1932), pp. 457 *ff.*

conclude that, for these six or eight districts taken as a group, the process of diffusion must after all have been working out fairly well as an underlying force, though with somewhat dissimilar speeds and degrees in the several districts. This inference is also supported by the data on foreign gold movements, examined in the next section.

Another important question concerns the relation of the fluctuations of the deposit relatives to changes in each of the various monetary factors which contribute directly to the current volume of circulating deposits, and particularly their relation to the movements of "circulating money" between the several districts. On this latter question the evidence provided by the district deposit relatives is necessarily incomplete, since these relatives do not include bankers' balances, exchanges, or currency in circulation. They are also influenced by factors that do not themselves necessarily involve any interdistrict movements of funds at all, such as gold imports or exports, open-market operations, movements of currency into or out of circulation within the district, shifts of funds from the demand to the time category or conversely, and the presence of excess or deficient reserves.

A certain part of these difficulties can be overcome at once. By definition, we have excluded bankers' balances from the category of money.[1] Shifts in the demand-time deposit ratio, internal currency movements, and the presence of surplus or deficient reserves were usually not important

[1] It may be pointed out that the relation of increases or decreases in the quantity of bankers' balances, held by a given bank in other districts, to the interdistrict movements of "circulating money" owned by nonbankers is not uniform. If a bank builds up its balances with banks in other districts by transferring surplus reserves, there is no movement at all of circulating money as defined in these studies (though the receiving banks may later expand deposits on the basis of the additional reserves acquired, without entailing any deposit contraction elsewhere in the system). Suppose instead, however, that a given bank's customers have deposited checks drawn on banks in other districts; and that the first bank, when it presents the checks for collection, merely leaves the proceeds on deposit in those

factors in the short-period fluctuations of deposits, at least up to 1932.[1] The movements of the district deposit relatives have therefore probably reflected fairly well (especially in short periods) the combined net effect of the *relative* gain or loss of funds by each district from these three principal sources: movements of funds to or from other districts, foreign gold movements, and open-market operations. *That is, when the deposit relative rose for a given district,* either that district was actually gaining funds in absolute terms from one or more of the indicated sources;[2] or the other districts in the aggregate were actually losing funds in absolute terms, either through gold exports or through open-market operations; or a combination of the two types of change was in process. Which explanation is correct in a given case can usually be determined fairly accurately from the movements of the *absolute* circulating-deposits figures for the district.

Certain steps were taken in the present investigation to test these inferences against the direct evidence available on the interdistrict movements of funds. The latter statistics, however, are complex; they are not adequate in all respects; and they contain some unwanted factors[3] which it is difficult to exclude statistically. Because of its laboriousness, the

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banks to its own credit. Then both the quantity of "circulating money" and the ownership of bankers' balances have increased in the first bank, at the expense of banks in other districts.

A further statistical complication is that it is impossible, in the existing published statistics, to distinguish intradistrict from interdistrict bankers' balances. Hence there are strong reasons of expediency, as well as of logic, for excluding bankers' balances from the category of "money," at least in making studies on a district basis.

[1] Also see footnote, p. 79, on the importance of these factors in the New York district.

[2] If a given district gains funds from other districts, and if no other changes take place, this interdistrict movement will, of course, show up in both the absolute and the relative deposit figures.

[3] Notably bankers' balances and operations between the several Federal Reserve Banks.

testing process was not pushed far, but the preliminary results obtained are consistent with the view that fluctuations of the district deposit relatives reflect fairly adequately the relative movements of funds into and out of each district from the three sources enumerated above. The relative importance of the three sources is examined at greater length for the New York district in the next section.

III. FACTORS ASSOCIATED WITH VARIATIONS IN DISTRICT DEPOSIT RELATIVES; THE NEW YORK DISTRICT

A number of the more general economic (nonbanking) factors, which it seems defensible to associate with the changes in district circulating-deposit relatives, were referred to at the outset of the discussion of Chart XI. The persistent decline of Kansas City, Minneapolis, and Richmond presumably reflects the increasingly disadvantageous position into which the production of cotton, the leading cereals, and livestock has fallen since the war, relative to industry and finance. The decline of Philadelphia and Boston similarly indicates the ground these older industrial districts have been losing to other industrial parts of the country, especially (for Boston) in textiles, and also their loss to the ever-growing financial and commercial dominance of New York. The relative decline of Cleveland since 1920 is doubtless associated partly with the migration of sections of the automobile industry to Michigan (which is in the Chicago district), and partly with the cessation of rapid expansion in the coal, iron, and steel industries of the western Pennsylvania, Ohio, and eastern Kentucky regions. Atlanta's rise through 1925 is probably traceable both to the industrial renaissance of the South after the war and to the effects of the growing winter migration of Northerners to Florida, with its attendant tremendous, if ephemeral, real estate boom in the middle 1920's. Both of these movements subsequently diminished their rate of growth. The horizontal

trend of Dallas seems to be the resultant of slow declines in cotton after 1923, increasing petroleum exploitation, and the varying fortunes of the southwestern cattle industry. It has already been suggested that the rise of New York after 1923 is in the first instance traceable largely to the increasing attraction and power of its financial institutions and markets, and after 1930 to the financial safety it offered. The New York district's industrial and commercial activities (the industrial section of New Jersey is included in the district) were also expanding at a relatively rapid rate. The decline from 1919 to 1923 is less easy to explain, unless in terms of the postwar deflation of New York's wartime financial activities. Analogous comments can be made for most of the remaining districts, even on the basis of the limited data used in this study.

These observations all suggest, of course, that changes in the relative quantity of deposits held in a given district are quite closely associated over time with changes in the relative volume of business, or, more broadly, of "economic activity," which that district carries on through money exchanges. Some such hypothesis as this seems plausible enough, if it can be supposed that the exchange velocities of deposits do not change widely through time in any one district or in any one type of economic activity, or if these variations in velocity are at least not so great as to make the deposit relatives seriously unrepresentative. The latter loose assumption is probably the more tenable. But what precisely is meant by the "relative" volume of business carried on in a district, and how can this relative volume be measured? The comments made in the preceding paragraph were essentially non-quantitative in character and did not involve exact measurements at all. Can anything better be done?

The answer to this question is, "Probably yes, but not without a good deal of labor." A considerable number of

statistical series on industrial and commercial activity are available, and on regional bases corresponding fairly well to the Federal Reserve district divisions.[1] The task of reducing them to relatives of the country as a whole is substantial, however, and even when it is completed a serious problem of weighting and averaging still remains.[2] Because of these difficulties, only a few sample borings into this large and probably valuable body of material were made. It must also be remembered that the district deposit relatives here examined are for Federal Reserve member banks alone. Insofar as the comparative importance of member and nonmember banks in a given district has shifted, the value of our deposit data is reduced.

First, the Minneapolis deposit relatives were compared with the ratio, by value, of Minneapolis wheat flour shipments to total United States wheat flour shipments and output.[3] The smaller fluctuations of the deposit relative curve do not particularly resemble those of the wheat and flour curves. But from 1919 to 1933, the deposit relatives declined 31 per cent, the wheat shipment relatives 53 per cent, the flour shipment relatives 69 per cent. It seems

[1] See particularly the studies by James G. Smith, *loc. cit.* The comparisons made there, however, are of seasonal fluctuations alone. The conclusions reached (p. 491) are oriented primarily around the interdistrict movements of funds, but also support the general hypothesis suggested above. Movements of funds were found to be most closely related seasonally to trading in commodities; the seasonal fluctuations of bank deposits are related to the production and warehousing of goods.

[2] Each series must be weighted for its estimated importance in the given district, relative to the national total for that series; and each national series should be weighted for its estimated importance in the aggregate national economic activity. In certain ways the best measure of the latter magnitude is probably bank debits. But the use of debits in turn raises difficult questions over the appropriate allowance for differences, as between different regions and different types of economic activity, in the exchange velocity of bank deposits. A far smaller quantity of deposits is presumably required to support a given volume of debits in New York security dealings, for example, than in Minnesota wheat production.

[3] Semiannual figures, adjusted for seasonal. Shipment figures alone were used for the more detailed comparisons, because they were more complete. In a ten-year test period, they were found to be roughly proportional to output.

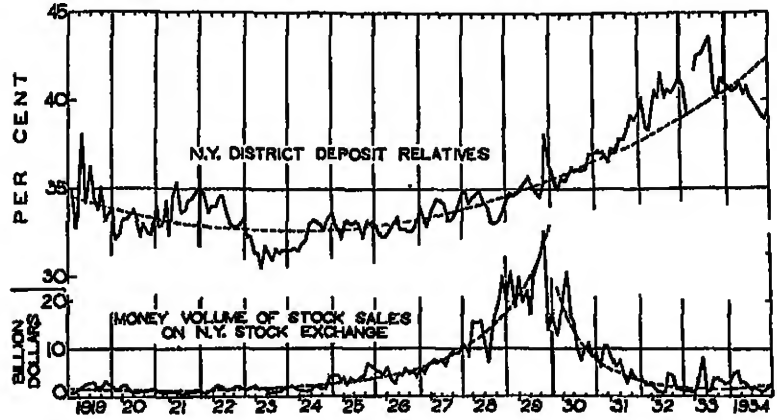
defensible to associate the long-run decline in the deposit relatives with the much greater decline in the wheat and flour relatives, since the other large economic factor in the Minneapolis district—the Lake Superior and Montana mining and metal industries—did not suffer any such catastrophic drop. Second, as remarked at an earlier point, analogous experiments were made for the Dallas district. The district figures for cotton production, petroleum production, and receipts of cattle at Fort Worth were used, all divided by the respective national totals (annual figures). No one of the three latter ratios taken separately corresponds with the movements of the district deposit relatives, but from an inspection of their fluctuations it seems probable that a defensible weighted average of the three could be established, which would move quite closely with the deposit relatives. Here again it seems reasonable to infer that the movement of the district deposit relatives was associated with measurable indices of the relative volume of business done in the district, though far wider and more careful testing is required before this conclusion can be established firmly.[1]

Finally, the New York district deposit relatives were plotted with the estimated figures for the money volume of stock sales on the New York Stock Exchange (now used *without* adjustment for seasonal), previously given on Chart IX; these figures, it will be recalled, are best regarded as an index of relative change, not as actual measures of absolute

[1] It should be stressed that the data show merely association, and cast no light on the question of "causal" relations. It can be argued either that the relative decline in the volume of business done by the district caused the relative decline in deposits, or, as some agricultural partisans have held, that a relative lack of funds caused business to move to other districts. The latter contention, however, seems the less plausible of the two. Within the Federal Reserve system, the several districts have equal access to the underlying reserves of the system as a whole. Whether any one district is in fact able to obtain and utilize a growing or a diminishing proportion of those underlying reserves depends on its comparative ability to attract and pay for loan and investment funds in competition with other districts.

quantities. The results are shown on the accompanying Chart XII, and are not without interest. From 1924, when the money volume of stock sales began to rise steadily, until the end of 1929 the general paths of movement are fairly similar, though the amplitude of the changes in stock sales is of course much greater. Moreover, the short-period fluctuations—within periods of two to three months—are

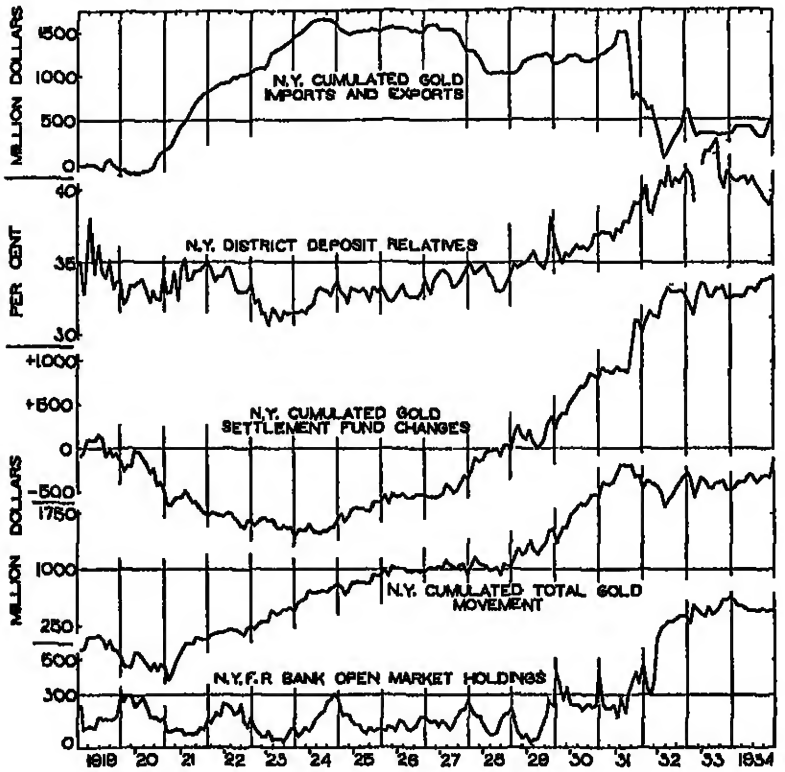
CHART XII.—NEW YORK DISTRICT DEPOSIT RELATIVES AND THE MONEY VOLUME OF NEW YORK STOCK EXCHANGE SALES, MONTHLY: 1919–1934



quite closely parallel at a number of points, with stock sales frequently showing an apparent lead of a month or more. The inferences which might be drawn from this will not be explored here. In view of the relatively great importance of security transactions in New York after 1923, the short-period relation between stock sales and the New York deposit relatives, which is thus suggested, seems not implausible. It carries with it, of course, the implication either that security transactions temporarily tie up substantial quantities of deposits, or that other types of activity (presumably chiefly financial) which do involve the use of substantial quantities of deposits themselves move in a fairly intimate short-period connection with security transactions.

These comparisons deal with the possible association between district circulating-deposit relatives and various measures of general economic activity within the several

CHART XIII.—NEW YORK DISTRICT: DEPOSIT RELATIVES, GOLD MOVEMENTS AND OPEN MARKET OPERATIONS, MONTHLY: 1919–1934



districts. Some interesting suggestions, partly positive and partly negative, can also be obtained by comparing the district deposit relatives with certain district banking-reserve factors. On the accompanying Chart XIII, the New York district relatives for circulating deposits are compared with cumulated gold movements into and out of the district, on domestic and on foreign account, and also with Federal Reserve Bank open-market holdings, monthly

from 1919 through 1934.[1] Note that the scales of the foreign gold, the Gold Settlement Fund, and the total gold curves are the same, while that for open-market holdings is twice as large, to bring out its changes. The foreign gold curve rises with net *imports* and falls with net exports. Some of the inferences that can be drawn from this comparison are striking.

It is obvious that the association between the general paths of movement of the deposit relatives and cumulated domestic gold movements (cumulated Gold Settlement Fund movements) is extremely close, particularly after 1921. On the scales here used, very nearly the same third-degree trend would fit both curves.[2] The month-to-month fluctuations of the two curves also show some relation, but not one close enough to be entirely conclusive; there seem to be no uniform lags or leads. In addition, by means of charts not reproduced here, the association of the weekly figures was examined for a number of years. In a majority of the years tested the week-to-week fluctuations correspond fairly well—

[1] *The data and their construction are given in Table V of the Appendix.* Open-market holdings are United States securities plus bills bought. The holdings in December, 1918, were so small (56 millions) that this is virtually a cumulated curve, comparable to those for gold.

Gold movements and open-market operations are the two principal sources from which the larger changes in *total* circulating deposits (for all the districts taken together) might be expected to come, in the proximate sense—as remarked near the end of Sec. II. The relation of total reserves to circulating deposits is also influenced, of course, by changes in the ratio of time and savings deposits to total deposits, a ratio which seems to have changed rather slowly; by rediscounting; by flows of currency into or out of circulation; and by the presence of excessive or deficient reserves. Up to 1932, the last two factors seem to have been of minor importance in the New York district. Rediscounting apparently takes place chiefly to restore deficient reserves, not to provide funds for projected new deposit expansion, and can therefore also be largely ignored in the present comparisons. Purchases of monetary gold for industrial uses, which would affect deposits or currency circulation and gold reserves in equal *amounts*, likewise seem to have been minor factors in the *changes* of deposits and gold holdings.

[2] Presumably, Gold Settlement Fund movements are also closely associated with those of bankers' balances, which are not reflected directly in the data here examined.

better, of course, in direction than in comparative degree—and quite frequently the cumulated gold movements lead the deposit relatives by a week. The association is not uniform, it is true, and at times is clearly indifferent, but was never markedly inverse in the years examined. This evidence too indicates that the very-short-period fluctuations of the two series, as well as the larger movements, tend to be related. But in short periods it is clear that other factors occasionally interfere rather seriously with the relation.[1]

On the other hand, the main path of the cumulated movements of gold to and from the New York district on foreign account is quite unlike the main paths of the New York district deposit relatives in most of its course, and is still more unlike the path of the cumulated New York domestic gold movements. Finally, New York Reserve Bank open-market holdings (the bottom curve on Chart XIII) show a resemblance to the deposit relatives at a number of points (as from the middle of 1922 to the middle of 1924; from mid-1927 to the end of 1928; at the end of 1929; in 1932 and 1934), but at other points they are indifferent or even inverse (1919–1921, early 1929, the middle of 1930, and the turn of 1930–1931). At some points they clearly operated to offset gold movements on foreign account (1920–1921, 1922–1923, the end of 1928, and, with a lag, 1931), but this relation too was not maintained consistently.

A more detailed comparison of the directions and magnitudes of the principal changes in these four curves gives the following results: From 1920 to 1924, roughly half of the gold that New York received from abroad was passed on to other districts through the Gold Settlement Fund. But this transmission was neither prompt nor uniform. New York apparently kept most of the first new wave of gold imports,

[1] The fact that the weekly and monthly deposit relatives were based on substantial interpolations between call dates must also qualify somewhat the weight of any conclusions drawn from them.

and its deposit relatives rose until the middle of 1921; then they began to fall, as the gold seeped into other districts. Similarly, New York kept most of the gold imported from mid-1923 to mid-1924, with a corresponding rise in the New York deposit relatives; very little of this last increment of gold was passed on, and thereafter New York began to gain gold on domestic account. The gold exports in 1924–1925 were drawn from New York and the interior in nearly equal proportions; the subsequent smaller imports were confined largely to New York. The net effects of these movements on New York are paralleled by the movements of the deposit relatives. The gold imports of 1929 were at first passed on to the interior, but a return flow to New York soon set in; the imports of 1930–1931 remained wholly in New York. On the other hand, the burden of the heavy gold export of 1927–1928 was borne in only slight degree by New York, as evidenced by the comparatively small decline in the deposit relatives and by the rapid gain of gold on domestic account, and the even heavier exports of 1931 came almost entirely from other districts, not from New York. The larger part of the exports of 1932 also came from other districts, but nearly all the subsequent imports stayed in New York (an initial flow to other districts was soon reversed, early in 1933). The 1931–1932 exports were also offset in part by open-market operations. The smaller fluctuations of 1934 were confined almost entirely to New York. On balance, New York thus gained gold in 1934 on both foreign and domestic account. The New York district deposit relatives, however, declined. This decline was due in some measure to the decrease in Reserve Bank open-market holdings, but probably in largest part to the *relative* contraction of deposits on other accounts; New York was piling up idle surplus reserves. In absolute terms New York deposits increased slightly in 1934, but those of other districts increased somewhat more rapidly, on the basis of

previous surplus reserves and despite losses to New York through the Gold Settlement Fund. The New York deposit relatives therefore fell. The data do not cover the large gold movements of 1935.

It is apparent that no brief and simple generalization can be drawn from these various facts. It is substantially accurate to say that the movements of the New York deposit relatives were almost entirely the resultant of three factors: domestic gold movements, foreign gold movements, and open-market operations. That much can be determined from visual inspection of the preceding chart and data. It is also substantially accurate to say that in general the first of these three factors was dominant. The New York deposit relatives fluctuated at most points quite closely with cumulated domestic gold movements. But this relation was at times seriously though temporarily disrupted by gold imports or exports, and by open-market operations. If we treat the gold imports and exports as original "disturbances," for example, in the sense adumbrated in Sec. I above and elaborated in Sec. IV below, it is evident that the country's reaction to them was not uniform. Broadly speaking, the larger part of the disturbances was passed on by New York to other districts. Over time and on the average, New York gained or lost only its roughly proportionate share of the gold which moved on foreign accounts, so that the disturbances themselves did not greatly and permanently alter the New York deposit relatives. But at certain times there was a marked lag in these adjustments, as in 1920–1922, when New York retained for some months much more than its proportionate share of the gold imports (and kept rather more than its proportionate share permanently). At other times, the interdistrict adjustment process virtually did not work at all. On some occasions the effects of gold imports and exports (usually the smaller ones) were confined almost wholly to New York, while the very large

exports of 1931–1932 left New York gold holdings virtually unchanged on balance. Largely because of offsetting open-market operations, these latter exports also left New York with a relative *gain* in deposits; a more than proportionate share of the proceeds of the open-market purchases remained in New York. The changes in and after 1933 were also unevenly distributed.

These various results raise some interesting problems. One, the question why New York deposit relatives move so closely with cumulated domestic gold movements, we shall not try to deal with here in detail. The three reserve factors that have been chiefly associated with relative deposit variations in New York, of course, have been domestic gold movements, foreign gold movements, and open-market operations. To the extent that Federal Reserve policy has offset foreign gold movements by open-market transactions, the domestic gold movements necessarily appear statistically to be dominant. But this leaves the reasons for the direction and fluctuations of New York's domestic gold movements themselves completely untouched. Presumably the proximate answer runs in terms involving the relative volume of financial and general business activity, such as were outlined a few pages above, though there is possibly some danger of circularity in this reasoning. We shall not, however, go farther with the problem here.

A second question concerns the reasons for the lack of a closer connection between New York's deposit relatives and its foreign gold movements. A part of the explanation, of course, is to be found in the open-market operations of the New York Federal Reserve Bank, which have initially offset a good deal of the foreign gold movements. But examination of the preceding chart shows that up to 1931 these offsets were incomplete, temporary, and often not manifest at all. At most, the open-market operations "cushioned" the short-run effects of foreign gold movements, without

permanently canceling them. To 1931, so far as they were related to foreign gold movements, open-market sales were followed comparatively quickly by purchases, and conversely.

Substantial discrepancies therefore still remain to be accounted for between the New York district deposit relatives on the one side, and the algebraic sum of New York's foreign and domestic gold movements and its open-market operations on the other. For example, it might seem superficially plausible to contend that a gold import, so far as *not* offset by open-market operations, would either remain entirely in the New York district, in which case the New York deposit relatives should rise; or would all drain into other districts, in which case both the deposit relatives and the cumulated Gold Settlement Fund figures would fall for New York; or would follow some middle course. In each case, the resultant of the movements of the deposit relatives and the district Gold Settlement Fund figures should apparently mirror the gold import quite closely. But this does not work out very exactly in the statistics. There are two chief explanations. In the first place, gold exports and imports are only one source—and often not the chief source—of the physical gold that flows to and from each district. The other main sources are gold stocks previously held and new domestic gold production. In the second place, gold imports into New York from abroad (for example) may be made for the account of individuals, firms, or banks in the New York district; or for the account of foreigners having balances with the New York banks; or for the account of individuals, firms, or banks (including Reserve Banks) in other cities. Only in this last case would the gold imports show up directly in the Gold Settlement Fund figures, and then only if the gold were actually withdrawn from New York. In the latter event, the New York deposit relatives would likewise *fall*, but at

the outset only in proportion to the absolute size of the gold import itself. In the second case, the deposit relatives might also fall; but if the gold, instead of being purchased with existing New York balances, were used by foreigners to build up such New York deposit balances, they would *rise*. In the first case, imports for *nonbankers* would extinguish deposits and cause the relatives to fall, but at the outset imports for bankers would leave them unchanged. In view of all these possibilities, it is therefore not to be expected that the relation between foreign gold movements on the one side and domestic gold movements and district deposit relatives on the other should be unequivocally close at all or even at most points. Even apart from offsetting open-market operations, the two sets of gold movements arise from, and lead to, rather different types of transactions.[1]

Third, although the New York district deposit relatives are clearly associated closely with the cumulated movements of gold to and from other districts, the data presented above give no direct evidence on the *quantitative* aspects of this relation. Is a dollar of gold gained from other districts accompanied or followed by one dollar's expansion in deposits, or by five, or by ten? The very fact that the trends of the two curves are so closely similar (on the scales selected for Chart XIII) suggests that the latter figure is more

[1] There is evidently some little ground for inferring that district Federal Reserve Bank holdings of *surplus* gold reserves, in excess of deposit and note requirements, vary chiefly with cumulated gold imports and exports; in the main, such imports and exports have not produced parallel variations in the New York deposit relatives. On the other hand, apparently gains or losses of gold to other districts *have* been allowed to produce parallel expansions and contractions of deposits. This is merely an inference, however, which has not been tested, and the second part of it involves certain unchecked assumptions as to the mechanisms involved. Two other comments should also be made. First, the note circulation of the Reserve Banks should also be included, to yield district relatives for aggregate "circulating money," if accurate comparisons with Reserve Bank gold are to be made. Second, in recent years supplies of eligible paper have at times been deficient. This makes it necessary to use the theoretical minimum gold-reserve figures at each point, rather than the actual ones, in testing the inference stated above.

nearly correct, on the average and over time, than the first. In other words, it suggests that the prevailing ratio of perhaps eight to one, between New York district circulating deposits and member bank reserves, is quite quickly established with respect to changes in reserves arising from gold gained from or lost to other districts. The data presented above are insufficient, however, to test this inference conclusively.[1]

A final purely speculative suggestion may be ventured as to the character of the process that caused the New York district to gain both domestic gold and relative deposits so heavily in the second half of the 1920's, and thus gave it so tremendous an expansion. The suggestion is based on a consideration of Charts XII and XIII taken together. It is evident that foreign gold imports were not the chief *proximate* reason for New York's absolute and relative expansion, since by the end of 1923 the larger part of the foreign gold had flowed inland. A not implausible hypothesis can be set up, however, as follows: The proximate initiating factor in the expansion was foreign gold imports; the gold spread fairly evenly throughout the country at the outset (to 1923–1924), and induced both comparatively easy

[1] The inference would clearly not apply to gold movements on foreign account, at least in short periods. Some of the reasons for this difference were suggested in the preceding paragraph.

Moreover, no account has been taken in the present paragraph of time and savings deposits in commercial banks; yet the effect of gold movements may conceivably be concentrated chiefly on them rather than on circulating deposits. Some exhaustive sample tests, not presented here, were made of this possibility. A weighted sum of the two types of New York deposits was constructed, each type being given a weight corresponding to the minimum reserve requirement against it (3 per cent for time and savings deposits). Up to 1929, the short-period (one to three months) fluctuations of this weighted sum show a rather closer correspondence to the fluctuations of the cumulated Gold Settlement Fund curve for New York than do the similar fluctuations of circulating deposits alone, though after 1929 the general path of movement corresponds less closely.

Nor do the comparisons allow for changes in New York Reserve Bank note issue, though this was ordinarily a comparatively small factor in the utilization of New York gold reserves.

money-market conditions and a general industrial and commercial expansion. The actual and potential further increases in business profits then started an upward movement in stock prices. Since the chief security-trading center is New York, New York became the principal focus of this increased stock trading. New York thus attracted to itself both interior deposits and interior gold, in proportionately equivalent amounts and at roughly the same times (the gold here serving chiefly to settle interdistrict payment balances, for funds currently or previously sent into the New York financial markets). The funds received from the interior in turn further stimulated the security markets, thus setting up a self-generating rising spiral. The whole process was facilitated and prolonged by the relatively easy money rates which the gold imported from abroad permitted throughout the nation; the expansion continued until security prices had gotten so grotesquely out of line with business facts that a collapse was inevitable sooner or later. The data presented above are consistent with this hypothesis, and the initial "cause" here postulated, the gold imports *of the early 1920's, can be explained easily enough in terms* of the contemporary monetary and general economic situation of the leading European countries.[1]

One among several possibly suspicious elements in this hypothesis is the fact that the New York deposit relatives *continued* to rise smoothly after 1929. Did New York's

[1] The reader's attention may be recalled to the conclusions at the end of Chap. II. It was there pointed out that the data examined suggest that the quantity of money moves with or after measures of business activity, not before. This is not inconsistent, however, with the hypothesis that gold imports were the proximate initiating factor in the expansion of the 1920's. Relative to the size of the money supply, their absolute amount was not large, and the much more than equal expansion of deposits which they eventually supported came only with a substantial lag. It can therefore be contended that the sequence of events was somewhat as follows: gold imports, easy bank reserve positions, easy money markets, business expansion, deposit expansion. For evidence of the actual lag of business expansion behind gold imports in 1920–1924, and of deposits behind business, compare Chart XIII with Charts IV and IX in Chap. II.

attractiveness as a center of banking safety begin to grow precisely at the time when its attractiveness as a security-trading center began to wane, so that New York continued to increase the *proportion* of the country's aggregate circulating deposits which it held, despite the great shrinkage in the absolute size of these deposits after 1930? To this question the data presented above give no conclusive answer, though they make an affirmative seem plausible.

IV. INTERDISTRICT DEPOSIT ADJUSTMENTS TO "DISTURBANCES"

The problem which was originally envisaged under the above heading can be stated as follows: Suppose that a substantial initial "disturbance" takes place in a given district, such as a sudden expansion of deposits due, say, to large gold imports. In the typical case, does the district usually keep all or most of this initial deposit expansion, or does the bulk of the expansion overflow proportionately into other districts, thus leaving the *relative* importance of the various districts substantially unchanged? If the latter happens, what is the character and duration of the interdistrict adjustment process?[1]

A certain amount of evidence bearing on this problem was presented in each of the two preceding sections. In Sec. II, it was shown that the general paths of movement of the deposit relatives for six or eight small but dissimilar districts were on the whole strikingly parallel after about 1923. From this it was inferred that the great ups and downs of the years following 1923 must have affected these districts in roughly equal degree. This in turn suggested that a process of adjustment as between these districts must have been operating fairly effectively, since each district also went through substantial general economic perturbations peculiar

[1] Also see the article by the author and K. F. Ficek, The Expansion of Bank Credit (*Journal of Political Economy*, February and April, 1933).

to itself. In Sec. III, it was further shown that the effects of foreign gold movements into and out of New York were on the whole fairly well disseminated throughout the country, though this was far from an invariable rule, and in some cases the rule did not work at all. Moreover, in the case of New York, it was evident that a number of other complicating factors were in play, which at times, in the data employed, seriously obscured the character of the interdistrict adjustment processes.

It therefore seemed worth while to try another line of attack. To the extent that disturbances can be isolated (actually, of course, they have in considerable degree overlapped one another in the postwar period), and to the extent that their effects are disseminated to other districts instead of merely changing more or less permanently the relative importance of the district initially involved, the following hypothesis seems plausible. Suppose that the district receives a large gold importation from abroad, for the account of its own commercial banks or business firms. Then its deposits, other things being equal, will expand at once one for one with the new gold. A larger secondary expansion is likely to appear later, other things again being equal. But the district is then likely to increase its purchases from other districts. Some or most of the new gold will flow out to settle clearings balances, and the other districts will in turn expand. Their expansion may go "too far," however, and they will then lose deposits and gold to the first district. The process of adjustment and readjustment will go on with diminishing amplitude (and perhaps with diminishing periods between oscillations) until, other things still remaining equal, the several districts regain something like their original degrees of relative importance. It appears reasonable to think that the first main wave of adjustment will be fairly well defined and that its completion will take a number of weeks or months, but that different rates of

dissemination will make the secondary waves of readjustment increasingly difficult to bracket within definite time periods, and perhaps even to establish clearly.

Despite the practical and the logical difficulties involved, this hypothesis seemed sufficiently interesting, and, if supported, sufficiently significant, to be worth testing. For several districts, over trial periods of four or five years, trends were removed from weekly district deposit relatives, seasonals were allowed for when it seemed appropriate,[1] and the resulting residuals were charted and examined. Unfortunately the results were inconclusive, either positively or negatively, and for that reason they are not reproduced here. In some cases, however, it is only fair to state that there seemed to be definite indications of a series of cyclical fluctuations which diminished both in amplitude and in period. The first cycle in one series, measuring from peak to peak, was about 35 weeks in duration, the second 17, the third 12. But in other cases no such pattern could be established with any assurance.[2] In all these cases, too, it seems clear that, although monthly figures are not sufficiently sensitive for such tests, weekly figures are too susceptible to essentially irrelevant fluctuations to be very useful. Probably semimonthly averages would be better.

In summary, then, this preliminary exploration into the nature and operation of interdistrict adjustments to disturbances has yielded little in the way of definitive results. It did serve, however, to clarify the problem. It revealed some of the difficulties inherent both in the available material and in the problem itself, and it produced certain suggestions that more elaborate investigations will perhaps make fruitful. A solution of the problems here involved is evidently of great importance to an adequate

[1] These trends and seasonals, of course, are district differentials; they relate to differences, of these types, between the district figures and the national average.

[2] There was no evidence of differential cycles of greater length.

understanding of the internal working of our monetary and general economic machinery, and the problems themselves deserve far more careful attention than students have hitherto given them.

V. SUMMARY

The main results of the investigations that have been described in this chapter are as follows:

1. In the period 1919–1934, every one of the twelve Federal Reserve districts shifted materially in its relative banking importance, as measured by the proportion of the national aggregate of circulating deposits which each district holds. The relative importance of some districts fluctuated, while that of others has declined persistently since the end of the war or shortly after. New York, which from this point of view is three times as large as the next biggest district, followed a pattern of behavior completely unlike that of any other district.

2. The material examined clearly suggests that the relative banking importance of each district, as measured by circulating deposits, varies with the relative volume of business that the district carries on. This conclusion seems a priori plausible, but much wider testing is required to establish it definitely.

3. A study of banking-reserve factors in the New York district shows that the New York circulating-deposit relatives follow closely the same general trend as the cumulated Gold Settlement Fund movements for New York, especially after 1921, and in a number of cases the two curves also show a substantial relation between their short-period fluctuations. At times, however, this short-period relation is seriously disturbed by foreign gold movements and by open-market operations. To a considerable degree the New York open-market operations chiefly served in actuality—whatever their purpose—as a partial

and usually temporary offset to foreign gold movements, except in late 1929.[1]

4. The degree and character of interdistrict deposit adjustments to "disturbances" were partially tested by three types of data. The roughly parallel trends of six or eight district deposit relatives, and the apparent effects of foreign gold movements through New York, suggest that large disturbances originating in any one district tend, on the average, to be diffused fairly evenly to other districts. But this diffusion is not uniform in either degree or timing, and it sometimes fails to appear at all. The attempt to detect diminishing cycles of adjustment resulted inconclusively.

5. Perhaps the most striking result of this chapter as a whole is the demonstration which it provides, that the country is neither characteristically homogeneous in its reaction to broad banking movements, nor characteristically heterogeneous. Lack of uniformity of either type is the touchstone. The several districts have undergone marked fluctuations and enduring shifts in relative importance since 1919, and the great national deposit expansion and contraction of 1922–1932 affected them quite unequally in the aggregate. On the other hand, a considerable group of districts did follow roughly similar general trends after 1923, and in a majority of cases the response of the other districts, *taken as a whole*, to foreign gold movements through New York was at least moderately uniform. Hence it is clear that the pattern of interdistrict relations and adjustments is extremely complex, and that more definite generalizations concerning them must wait on the study of substantial quantities of additional evidence.

[1] The association of deposit relatives and domestic gold movements was tested only for the New York district. It seems likely, however, that a close association also exists in the other districts, since for them foreign gold movements and open-market operations are usually of comparatively small importance.

Chapter IV

THE EXCHANGE VELOCITY OF BANK DEPOSITS

I. THE MEASUREMENT OF THE EXCHANGE VELOCITY OF CIRCULATING DEPOSITS

THE "exchange" or "transactions" velocity of money is the average number of times that a unit of money changes hands in a unit time period. Exchange velocity stands in sharp distinction to the "circular" velocity of money discussed in the next chapter, both with respect to its significance and with respect to the methods appropriate for its measurement. Numerical values for the exchange velocity of money can be estimated, as is familiar, by a relatively simple process. Broadly speaking, the estimated money volume of transactions conducted with money in a given period is divided by the average stock of money outstanding in that period. The quotient, if the data are accurate, is the number of times that the average unit of money has turned over, or has changed hands, in the given period.

From the very method of measurement, it follows that the exchange velocity of money is in the first instance merely a measure of the "efficiency," or, perhaps better, the "intensiveness," with which money is currently being used. Conversely, if the quantity of money is constant, or at least fluctuates sluggishly, the movements of exchange velocity are also a rough but convenient measure of changes in the volume of money transactions, especially in short periods. They are hence also a rough index of the fluctuations, especially in short periods, of general economic activity. Caution must be exercised, however, in using them as an index for this latter purpose. The exchange velocity

of money is not the same in all branches of economic life at any one time, and during certain periods those branches in which it is high, such as security trading, have apparently had a disproportionate influence on the general average. Moreover, exchange velocity necessarily reflects to some degree the character of contemporary business organization. If business becomes more highly integrated, exchange velocity will fall, other things being equal, since a larger proportion of the total of payment operations is now carried on by book transfers within the integrated units than before; these book transfers do not require the use of actual "money" for effecting settlements. A decline in exchange velocity from this source would clearly not signify any decline in the "real" or the "physical" volume of economic activity.

In the present study, it is proposed to examine the exchange velocity of "circulating" bank deposits alone, that is, as explained in Chapter II, of deposits subject to check with duplicating items removed. The estimates of the exchange velocity of *currency*, made before the war by Professors Kemmerer and Fisher, are familiar to all students, but it has not seemed practicable to bring these estimates down to date in the present investigation. The small proportion that outside currency has formed of "total" money and even of "circulating" money in recent years, however (see Chapter II), makes this omission of the exchange velocity of currency comparatively unimportant. As to time and savings deposits, there appear to be no data adequate for measuring their rate of turnover in the past, and the interesting problems involved in this rate must therefore be ignored.

The exchange velocity of circulating bank deposits can be estimated by use of the data on debits to individual accounts in a considerable number of centers, which have been reported weekly to the Federal Reserve Board since 1919. The debits data, divided by the estimated volume of

circulating deposits, give figures that can be viewed as a rough index of the exchange velocity of circulating bank deposits—though it should be clearly understood that, for reasons to be presented in a moment, these figures are *not* a direct measurement of exchange velocity itself. Computations of this sort have been made over a number of years by the New York Federal Reserve Bank. It is believed that the estimates presented below are rather more accurate in certain respects, and they are subjected to a more intensive process of scrutiny and comparison than the Reserve Bank has undertaken in its published materials.

The precise method of computation is indicated in a note accompanying Table VI of the Appendix. The following general comments on the method and the data are appropriate at this point, before the results are described:

1. The weekly debits figures used are debits to individual accounts as reported to the Federal Reserve Board by the clearinghouse associations in 141 centers. Presumably the debits of banks in these centers which are not members of the Federal Reserve system are included, though there is no statement in the published data on this. On the other hand, the debits of banks not located in one of the 141 centers forming the present standard group do not get into these data at all. The debits figures we use here are therefore only a sample, though a large and presumably quite stable sample. Federal Reserve officials and others have estimated at various times that the sample includes 80 to 85 per cent of all debits to individual accounts in the country.[1] Since the actual size of the debits universe is not known with any certainty, however, it has seemed safer not to try to extrapolate the sample to an estimated national total.

[1] Professor M. A. Copeland concluded that reported debits for the 141 centers were about 80 per cent of all debits up to 1926, and in 1926 were 85.5 per cent. See his article in the *Journal of the American Statistical Association*, 1928. This conclusion necessarily rests, however, on an estimate of total debits which from the very nature of the materials is somewhat uncertain.

The debits omitted may be partly those of some large banks outside the 141 centers, but are presumably chiefly those of the smaller country banks. The debits series begins with 1919, but, because of shifts in the number and location of the weekly reporting banks, it does not become very reliable until 1921; from 1921 on, a fairly stable sample is available for 141 leading cities.[1] The data on velocities presented in this chapter therefore begin in 1921.

A further difficulty with the debits statistics as published is that, in the period here covered, they include debits to time accounts as well as to demand accounts. There is no present way of adjusting this difficulty directly.[2] We have therefore followed the practice of the New York Federal Reserve Bank, and have assumed that time accounts turned over twice a year. A proportionate subtraction on account of the assumed debits to time accounts was then made from the weekly debits figures as reported. This procedure is certainly inaccurate, but no other is available. The adjustment is in any event relatively small, and probably does not greatly alter the fluctuations of the debits or the velocity figures.

2. The deposits figures here used, by which reported weekly debits are divided, are estimated weekly "circulating" deposits of reporting member banks; that is, they are deposits subject to check (including United States deposits), with duplicating items removed as far as possible.[3] This

[1] The method used in treating the debits data is discussed in connection with Table VI in the Appendix.

[2] In recent months, however, the Federal Reserve reports have begun to segregate debits to time and savings accounts in weekly reporting member banks. This will eventually provide much of the desired information, though the omission of nonmember banks makes this series not quite comparable in area covered with the series referred to in the preceding paragraph.

[3] The *weekly* series for circulating deposits here used is not strictly comparable with the *monthly* series used in Chap. II. The latter series was computed from data in the Reports of the Comptroller of the Currency. The weekly series is based on data in the Weekly Reports of the Federal Reserve Board. It includes net demand deposits, government deposits, and estimated exchanges minus the net due-to-

sample is much smaller than the debits sample. The member banks which report deposits weekly hold, roughly speaking, something over three-quarters of all member-bank circulating deposits, but the member banks in turn hold only about two-thirds of the national aggregate of circulating deposits. The sample afforded by the weekly reporting bank figures is, therefore, for the period as a whole, only a little more than three-fifths of all circulating deposits. In 1921–1932 the sample varied between 57 and 67 per cent of the total, but in 1933 and 1934 the proportion rose to 75 and 72 per cent, respectively. Adjusted circulating deposits as reported weekly were nevertheless used, without allowance for these variations, to obtain the velocity figures given below.

A more accurate picture of the absolute size of the velocity figures for the country as a whole over time would perhaps have been secured by interpolating, between the monthly estimates for all circulating deposits given in Chapter II, weekly estimates for *all* circulating deposits, based on the available weekly reporting member-bank sample. Two considerations militated against this procedure. One was purely practical. At the time the velocity study was begun, the monthly estimates presented in Chapter II had not been calculated, and even the annual figures were uncertain. The interpolation just suggested, and also any other allowance for variations in the relative size of the weekly reporting bank sample, would have required reworking all the velocity computations. Since the matter of chief interest here is short-period changes, and since the shift in the relative size of the sample from one year to another was usually not great (except in 1932–1933), the probable gain in accuracy did not seem sufficient to justify the labor involved in

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banks item. The method of estimating weekly exchanges, which are actually reported only on call dates, together with the other details of the computation, are given in a note accompanying Table VI in the Appendix.

such a recomputation of the weekly figures.[1] Second, the interpolation would increase the short-period fluctuations in the sample. Since the deposits not included in the sample are presumably stabler than those which are, this seemed undesirable. These considerations do not apply, however, to the series for New York City. Nearly all New York City debits and demand deposits are reported weekly.

It should also be recalled that the group of banks which report deposits weekly is not coterminous with the group reporting debits weekly, for the country as a whole. This introduces a further element of uncertainty into the velocity computations, and one which cannot be adjusted from the published statistics.

3. It follows from these considerations that the results obtained, from dividing debits as thus adjusted by estimated circulating deposits, are less accurate in their general order of magnitude than in their short-period fluctuations. It also follows, as was remarked at an earlier point, that these results are an index of the exchange velocity of circulating bank deposits, but *are not themselves this velocity*. On an average, the actual velocity figures for the country as a whole were probably equal to the velocity-index figures

[1] The ratio of weekly reporting bank circulating deposits to all circulating deposits on the June call dates (not themselves always accurately representative) were, in percentages:

1921	59.0	1928	57 9
1922	66 6	1929	57.0
1923	65.9	1930	61.1
1924	63.9	1931	64 3
1925	64.1	1932	62.0
1926	65.4	1933	75.0
1927	59.0	1934	72.0

The fluctuations in this ratio mean that the fluctuations of exchange velocity as computed *from the weekly deposits sample exaggerate (inversely)* the "*real*" year-to-year fluctuations. The computed velocity figures for 1929, for example, will be "too high" relative to those for other years, because in 1929 the deposits sample *was relatively* small.

presented below, multiplied by about 0.75 for 1921–1932 and by about 0.89 for 1933–1934. That is, the actual figures were probably lower by about 25 and 11 per cent, in the two periods respectively, than the indices presented. These coefficients of multiplication attempt to allow for both the debits and the deposits not reported, but they are themselves so uncertain with respect to the debits extrapolation that it has not seemed worth while to work them out year by year, or to adjust the velocity indices to correspond. The results for New York City alone, however, as previously remarked, are probably very nearly the true exchange-velocity figures, since the great bulk of New York City debits and circulating deposits is reported weekly.

4. The velocity indices presented below have been computed on three different geographical bases and for several different unit time periods. The geographical units are the country as a whole (based on debits for 141 cities); New York City alone; and the remaining 140 interior cities. Because the debit and the deposits samples are not quite coterminous geographically, a more detailed regional division would be of uncertain significance, even if the published statistics permitted it to be attempted. Exchange-velocity indices were constructed for each of the three geographical units. For this purpose, what are in effect weekly averages of *daily* figures were first calculated, after adjustment for the varying number of working days in the given week.[1] To avoid working with exchange-velocity figures smaller than 1, the weekly averages were then expressed in terms of their *annual* equivalents: the weekly averages of daily figures were multiplied by 302, the average number of working days in

[1] It is interesting to note that this allowance for holidays apparently over-adjusts the data somewhat. The inference is that individuals and firms push forward (or sometimes postpone) a substantial part of their payment transactions when a holiday is impending, thus leaving the total for a period of say two weeks not far below what it would have been with no holiday.

a standard year.[1] Finally, semimonthly[2] and monthly averages of the weekly averages were obtained. This latter procedure avoids the tedious adjustments otherwise required to allow for differences in the number of calendar days and of working days in the month. It should be noted that, while the week seems to be the most significant time unit for some purposes, and the half month for others, the month is certainly too large for accurate exchange-velocity studies. It blurs over characteristic and important features of the data.

II. THE GENERAL BEHAVIOR OF THE EXCHANGE-VELOCITY INDICES; INTRAMONTH CYCLES; SEASONALS

From what has just been said, it is evident that the data on the exchange velocity of circulating deposits contain substantial factors of unavoidable error, and that the figures finally obtained must be merely *indices* of velocity, not estimated exchange-velocity figures themselves. Despite these limitations, a study of the indices yields a number of significant results—some positive and some negative. This is particularly true with respect to short-period fluctuations, within periods of a few weeks or months. The picture of changes from one year to the next is presumably made

[1] This multiplication by a constant, instead of by the actual number of working days in the given year (sometimes greater or less than 302), of course avoids variations in computed exchange velocities which are due simply to differing lengths of the year itself. Such variations would be spurious for most of the purposes contemplated in this study. But in comparisons of total money transactions per year with other measures of volume per year, it would be necessary to reintroduce these variations unless the other measures were already thus adjusted. The adjustment is small, however, usually not more than plus or minus 0.3 per cent.

[2] When the reporting month contained five weeks, the middle week was divided equally between the first and second halves of the month. The assumption involved in this procedure—that the middle week is close to the average for the month—is not quite accurate, but is defensible for the present purposes. The difficulties over reporting weeks that fall in two different months were disregarded because of the great labor required to adjust the data for this. Rough tests indicate that the resulting error is not important.

inaccurate by shifts in the relative sizes of the samples used, and there is no present way of determining satisfactorily whether these shifts were mutually offsetting or mutually exaggerating.

On the accompanying Chart XIV are presented semimonthly indices for the exchange velocity of circulating deposits in 1921–1934, computed by the methods just outlined, for the country as a whole (141 cities), for New York City alone, and for the 140 other cities.[1] The scale is logarithmic. The great differences between New York City and the rest of the country in some respects, and the marked similarities in others, are at once manifest. The New York City velocity index maintains a much higher level throughout. It also rises and falls over a greater range through the period as a whole, reaching a peak of about 140 in 1929 as against only 51 for the other cities, and rising from its 1921 average by roughly 190 per cent to the peak as against a rise of only 82 per cent for the other cities. Its relative decline to the end of 1932 is even sharper than the preceding rise. The short-period fluctuations are also somewhat greater for New York City, even in relative terms.

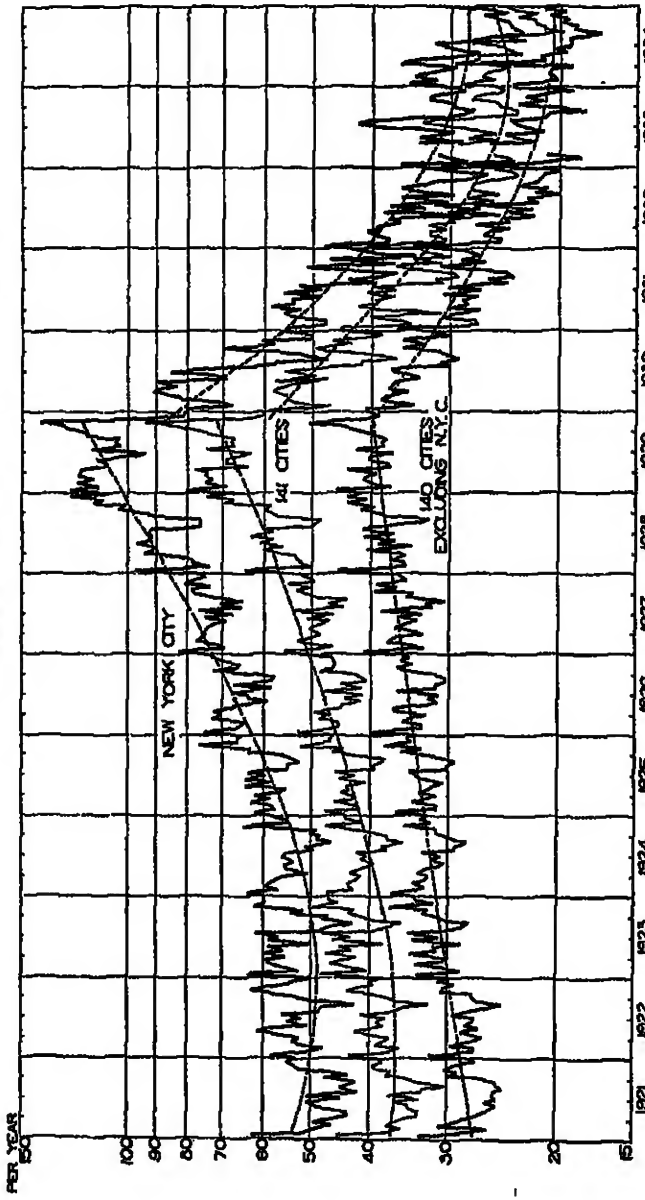
On the other hand, apart from this difference in their amplitudes of fluctuation, the general paths of the curves for New York City and for the 140 other cities are strikingly similar in many respects. The chief differences are the fact that the New York City curve rises much more from 1928 to 1929 and the fact that in 1921–1929 its computed trend

[1] Note that, whereas in the preceding chapter we were concerned with the New York Federal Reserve *district*, in the present chapter we deal only with New York City. The remainder of the New York district, so far as it reports debits weekly, is lumped with the 140 interior cities.

The break in the curves in March, 1933, is of course due to the bank holiday. The fact that the banking system as a whole returned to a normal operating basis rather slowly makes the velocity figures for 1933, and perhaps for the first half of 1934, of rather uncertain significance.

Monthly data are given in Table VI of the Appendix; the semimonthly data used for Chart XIV are not printed in the present volume.

CHART XIV.—INDICES OF THE EXCHANGE VELOCITY OF CIRCULATING DEPOSITS, SEMI-MONTHLY: 1921–1934
(Ratio Scale)



was clearly concave upward even on this logarithmic chart (its *rate* of rise was increasing). The trend for the 140 other cities was nearly a straight line logarithmically, though markedly concave upward on an absolute scale. A more detailed examination also shows that the larger short-period fluctuations of the two curves were almost identical in timing and were at least roughly analogous in relative amplitude. New York City was more sensitive than the other cities to the changing factors that dominated the period here under consideration, but it would evidently be quite erroneous to assert that the exchange velocity of New York City deposits followed a pattern fundamentally different from that of the rest of the country. As shown in Chapter III, the situation with respect to the *quantity* of deposits themselves was quite otherwise; the New York pattern was completely unlike those for the rest of the country. But with respect to the *velocity* of deposits, New York and the rest of the country were fundamentally much the same. It is especially significant that this general similarity (after allowance for the difference in amplitudes) was *not* confined to the period of intensive security trading and speculation, from 1925 through 1930, but is characteristic of the whole period.

The velocity index for the country as a whole is in effect simply a weighted average of the other two, and necessarily falls between them. The fact that New York City debits constituted a majority of total reported debits to 1934, and until 1930 a growing majority, makes New York City dominate the national curve at many points. Since the national index reflects the combined effects of forces that are at times rather dissimilar, and since this combination or summation of forces is not itself particularly significant for the purposes here in view, we shall not use the national index in the comparisons to be made later in this chapter.

The question at once arises, how much of the fluctuations of the exchange-velocity indices is due to deposits, and how much to debits. No attempt was made to put through the laborious computations necessary to get an exact answer to this question. The general form the answer would take, however, is indicated clearly enough by the accompanying Chart XV (logarithmic scale). This chart shows the semimonthly values of the circulating deposits sample, of the debits sample, and of the exchange-velocity index obtained from them, all for the national total of 141 cities.[1] The debits and velocity figures are semimonthly averages of what are in effect daily figures multiplied by 302 to give the annual equivalents. From 1921 to 1928, the rise in reported deposits caused the velocity indices to rise less rapidly than reported debits, but the increase in debits was much more than sufficient to offset that in deposits, and the velocity index therefore moved steadily upward. From 1929 to 1932 this process reversed itself; debits declined more rapidly than deposits, and velocity declined. After the 1933 bank holiday, deposits recovered more rapidly than debits, and the velocity index therefore fell still further.

With respect to the longer movements of the curves, changes in debits and those in deposits thus played nearly equal parts in producing changes in the broad levels of the velocity index. It is too obvious to require more than mere statement, however, that the short-period fluctuations of the velocity index are completely dominated by those of reported debits. At most, the fluctuations of deposits slightly exaggerate or slightly damp down the short-period movements imparted to the velocity index by debits. At no important point do debits and velocity move inversely. Similar charts for New York City and for the 140 other cities, not reproduced here, tell precisely the same story

[1] The data themselves are not printed in this volume. Monthly indices of exchange velocity are given in Table VI of the Appendix.

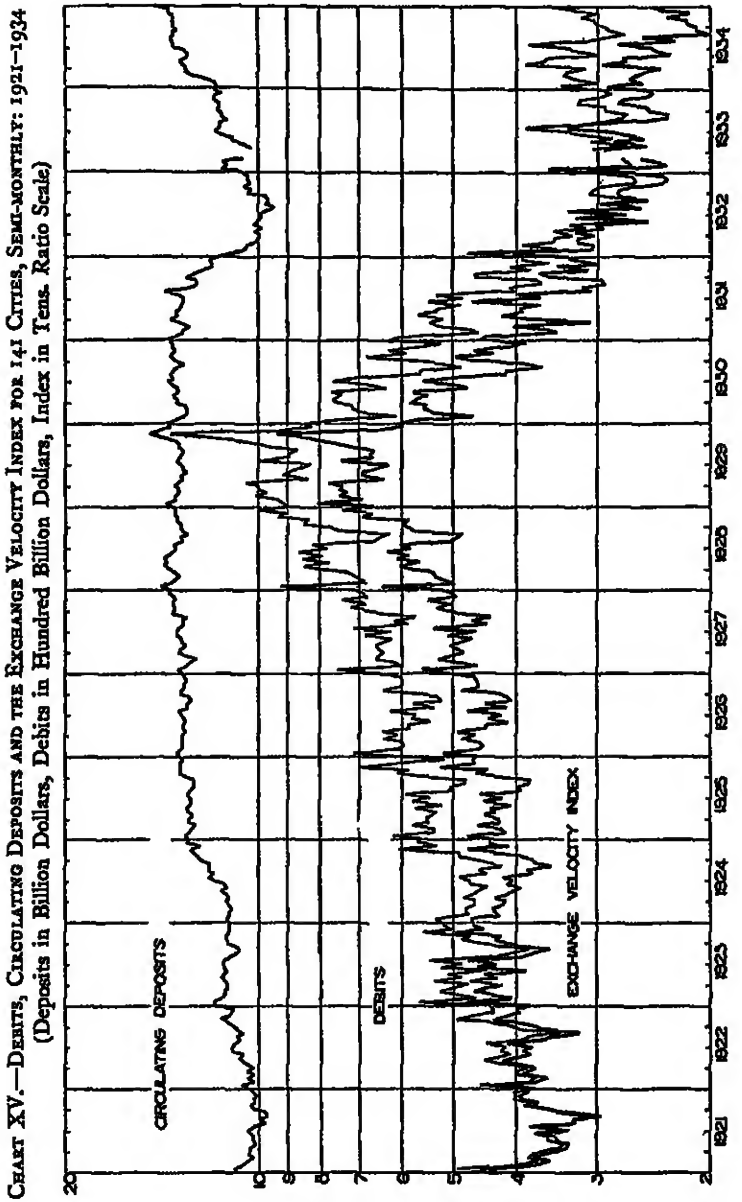


CHART XV.—DEBITS, CIRCULATING DEPOSITS AND THE EXCHANGE VELOCITY INDEX FOR 141 CITIES, SEMI-MONTHLY: 1921–1934
(Deposits in Billion Dollars, Debits in Hundred Billion Dollars, Index in Tens. Ratio Scale)

with respect to the short-period relations of the three variables for these other geographical units. With respect to the broader movements over time, the other units show certain differences from the pattern of the 141-cities curves. The general character of these differences can be inferred by comparing the movements of the three velocity indices previously presented on Chart XIV; they need not be elaborated here.

A more intensive visual and statistical examination of the semimonthly exchange-velocity indices on Chart XIV and of the original weekly data which lie behind the semimonthly series shows that in all the velocity indices at least four different types of movement can be established. There is a quite clear intramonth cycle, which differs somewhat for the several months; a heavily marked seasonal pattern, which is slightly different for each of the three geographical units considered and which is also somewhat different for the period before and the period after 1929; a characteristic "main drift" or trend for the period 1921–1934 as a whole, which it proved statistically desirable to break at November, 1929; and a fairly clear pattern of cycle-accidental deviations around the two parts of the trend. The trends and the cycle accidentals will be examined in the next section, where they are compared in some detail with the similar elements of certain other important statistical series.

The intramonth cycle in exchange velocity, as explained in the next footnote, has here been deduced from the cycle in debits. It is interesting chiefly for the picture it gives of payment habits, so far as payments are made with deposits. For the country as a whole (141 cities), the variation of the individual reporting weeks in each month averages plus or minus 5 per cent of the mean for the month. In ten months out of twelve, the first reporting week of the month is high, the second week low; in June the difference is small, and in September and December this order

is reversed. In all twelve months, the third reporting week is high and the fourth week is *low*, contrary to what might have been expected. This last characteristic is due chiefly to the fact that in the great majority of cases the reporting week that contains the end-of-the-month payments ends in the first days of the following month, and hence is reported as the first week in the following month. In addition, a given check is not debited to the drawer's account on the same day that it is credited to the payee, unless the two parties chance to use the same bank; usually there is an interval of one or more days. This makes reported debits, and therefore exchange velocities, lag somewhat behind the corresponding payment transactions. A more complicated calculation made on a daily basis, instead of the one made here on the basis of reporting weeks, would show a peak in the exchange velocity of deposits at the close of each month and in the first days of the following month, except in September and December, and a second peak (substantially lower except in June) at the middle of the month. This latter calculation has not seemed worth while, however, for the purposes here in view. A table of roughly computed values, for debits alone, is given in the accompanying footnote.[1]

[1] Testing indicates that the intramonth cycle in deposits, if it exists at all, is negligible. The following table for debits fluctuations for the country as a whole (141 cities), which I had prepared for 1923–1934 before the exchange-velocity indices were completed, is therefore a fairly adequate measure of the exchange-velocity fluctuations as well. The figures are averages of simple arithmetic average relatives of the original debits for the weeks in each month in 1923–1934, without allowance for trends or cycle-accidentals. Since the debits series ends not far from where it began, this rough procedure presumably does not involve serious error (the omission of 1921 and 1922 is also not important). No adjustment was made for seasonals or holidays. When the month contained five reporting weeks, the middle week was divided between the second and fourth reporting weeks; the fourth and fifth actual reporting weeks were then treated as the third and fourth weeks for the purposes of these computations. Some error doubtless results from this, since the middle week was usually somewhat above the monthly average. The following figures are averages for the country as a whole; those for New York City alone and those for the other 140 cities would doubtless be somewhat different. The results

The behavior of the several measures of seasonal variation of the exchange-velocity indices is shown on the accompanying Chart XVI. These seasonals are *semimonthly*, not monthly, since it was found that monthly data blurred over important and characteristic movements. They are computed from the data after division by the trend.[1] Seasonals are given for all three geographical groups. Since the trends are all broken at November, 1929 (for reasons that will be elaborated in the next section), two seasonal measures are given for each geographical unit. The two differ substantially in each case in details, though not in their larger characteristics.

These measures of seasonal variation in the exchange-velocity indices clearly all have the same general pattern and roughly the same substantial magnitudes. (Note that the vertical lines on the charts are drawn at the end of the month, and that the curves begin and end with the values for the end of December.) They are all high in the first half of January, low in August and September; they all show

for the period before November, 1929, are also somewhat different from those after, but the differences are not great enough to require presenting the two periods separately. In the table, the average for each month is taken as 100 for that month.

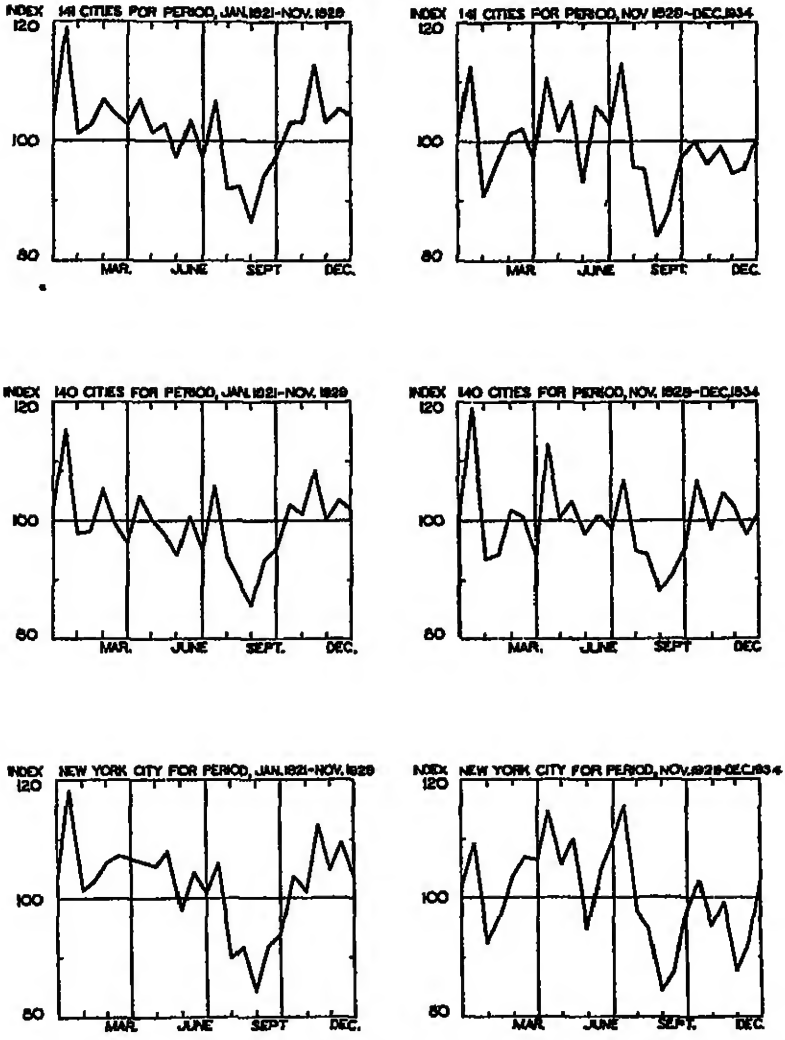
INDEX OF INTRAMONTH "CYCLES" IN DEBITS: 141 CITIES, 1923–1934

Month	Reporting Week				Month	Reporting Week			
	1	2	3	4		1	2	3	4
Jan.	118	101	92	89	July	118	99	96	87
Feb.	106	90	108	96	Aug.	112	98	98	92
March	108	96	103	93	Sept.	94	99	109	98
April	109	98	99	94	Oct.	112	90	102	96
May	113	97	100	90	Nov.	108	99	102	91
June	103	101	105	91	Dec.	97	101	111	91
					Average	108.2	97.4	102.1	92.3

[1] The data are given in Table VII of Appendix B. The method used is discussed in Appendix C.

secondary lows at the end of January and secondary peaks in the first half of July; through 1929 they all have a de-

CHART XVI.—SEASONALS FOR THE INDICES OF EXCHANGE VELOCITY, SEMI-MONTHLY: 1921–1934



clining general "trend" to August and a rising one thereafter, though after 1929 the "trend" is nearly flat from

February to June; and through 1929 they all show secondary peaks at the end of November, though after 1929 this peak shifts forward to October. Moreover, in the period up to 1929 the seasonals for New York City and for the 140 outside cities closely resemble each other in the direction, the timing, and even the general amplitude of their fluctuations, except from the end of February to the middle of May and except in the middle of August. The seasonal for the 141 cities, which is in effect merely a weighted average of the other two, therefore also closely resembles them both. In the period after 1929, however, the resemblance between the New York City and the 140 outside city seasonals is somewhat less marked. This is probably due in part to the fact that the trends for this latter period do not fit the original data so well. In both periods there are differences between the several geographical groups, but the differences are minor in numbers and importance as compared with the similarities. This demonstration that the seasonals for New York and for the 140 outside cities so closely resemble each other in general is rather different from what might have been expected, and evidently has appreciable significance.

A visual comparison with the other seasonal indices presented on Chart V also yields interesting results, though it must be remembered that the latter indices are monthly only, not semimonthly. There is clearly no resemblance at all between the exchange-velocity-index seasonals and that for outside currency, and not a great deal between them and the circulating-deposits seasonal. The August low is the only point of conspicuous resemblance to the latter, though both are high in January and rising after August. Nor can a case be made for the view that deposits move *inversely* with exchange velocity in their seasonal fluctuations, thus leaving check payments with no seasonal. There is also little similarity between the velocity seasonals and

those for construction contracts, industrial production, or car loadings, taken separately. The similarity is greater, however, for factory pay rolls (barring the January low in the latter); for exports; and also, barring December and January, for many of the seasonals in retail and grocery sales. The similarity is on the whole closest for the three series relating to New York security transactions, being more marked for bonds than for stocks. This latter similarity holds good for the velocity index of the 140 outside cities, as well as for New York City alone.

But while the velocity-index seasonals do not correspond closely in their aggregate pattern with any one of the nonfinancial seasonal measures, almost every one of the larger peaks and valleys in the velocity seasonals can be associated with a similar movement in one or more of the nonfinancial seasonals. This suggests the inference, perhaps not very satisfactory but still plausible, that the velocity seasonals can be explained only in terms of the presumptive seasonal in the aggregate of *all* transactions, financial as well as nonfinancial; and, indeed, that the velocity seasonals are perhaps the best available guide to this aggregate seasonal. It should also be stressed again that the seasonals for the 140 outside cities show no greater resemblance to the nonfinancial seasonals taken separately than do those for New York City alone, or for the 141 cities combined. The seasonal fluctuations in the exchange-velocity indices, as previously remarked, seem to follow much the same pattern over the whole country.[1]

[1] It can be argued, though not proved, that this results from the great and at times preponderant influence on bank debits of "financial" transactions—security trading and the like—in which exchange velocity is presumably high and which cannot be eliminated satisfactorily from the debits data. It can also be argued that this accounts for the high degree of similarity, barring differences in amplitude, in the long and in the other short-period movements of the exchange-velocity indices as between New York City and the rest of the country. In view of the great changes in the apparent relative importance of the "financial" class of transactions, however, this last hypothesis cannot be the whole story, and the comparisons just

III. TRENDS AND CYCLE-ACCIDENTALS IN THE EXCHANGE-VELOCITY INDICES; SOME COMPARISONS

A comparison of the longer movements of the exchange-velocity indices with those of other important series yields still more striking results, again partly positive and partly negative. For this purpose the indices for New York City and for the 140 outside cities are best examined separately, since their trends are quite different in curvature and their cycle-accidentals not the same at all points.

On the accompanying Chart XVII the velocity index for the 140 outside cities, which is presumably less influenced by purely financial transactions than that for New York City, is compared with a number of other broad measures of economic activity. The curves show monthly data adjusted for seasonal, with computed trends drawn in for each.[1] The trends of the series other than velocity are the ones given in Chapter II. They are all computed for data beginning in 1919, whereas the velocity data begin in 1921. It is apparent on inspection, however, that in most cases the trends fitted to these other series for 1919–1929 are also fairly representative of the shorter period 1921–1929. Indeed, for most of the curves they appear to provide a rather more significant generalization from which to measure deviations than would be provided by trends calculated for the shorter period. Despite the superficial inconsistency entailed by using different base periods, the trends have therefore not been recomputed.

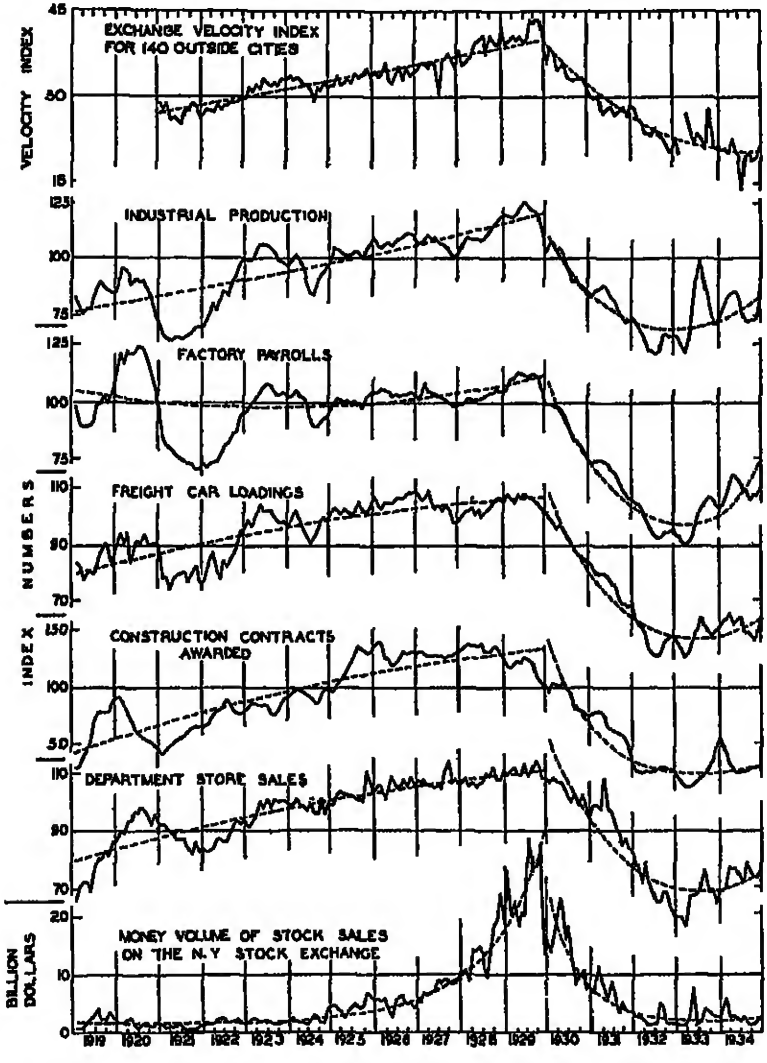
The several trends, all of second or third degree, are broken at the end of 1929; except that the velocity trend is broken at the middle of November, 1929. The same thing

made between the several seasonals hardly give it unequivocal support. A stronger case for it can be made from the comparisons presented on Charts XVII and following.

[1] The trends are computed by the short-cut method (previously referred to) described by R. A. Fisher and summarized in Appendix C.

was done in Chapter II, where the question was discussed briefly. Undoubtedly some students will object, on the

CHART XVII.—THE EXCHANGE VELOCITY INDEX FOR 140 OUTSIDE CITIES, AND OTHER SERIES, MONTHLY: 1919–1934



ground that this procedure implies a discontinuity in the forces at work which cannot really exist. There is, of course,

merit in this contention, and, if similar data for a substantially longer period were available, breaking the trends might seem not only unnecessary but palpably unrealistic. For data over this relatively short period of fourteen years, however, both of the latter considerations seem rather to work the other way. If single continuous trends were to be calculated for the whole period, then in order to fit the data at all closely they would have to be of much higher degree than those here used, a degree too high to be itself explained very easily; and a continuous trend of low degree would leave bulges of uncertain meaning in the residuals for most of the series, particularly around 1929 and 1932–1933. Moreover, the broken trends here computed fit the data fairly well. But all of them, except that for pay rolls, rise steadily through 1921–1929, and all of them are concave *upward* in 1929–1934.[1] This seems to lend support to the doctrine of discontinuity, relative to the period in view—to indicate that the violent and progressive deflationary movement manifested in every one of these curves after 1929 was "a new thing" for this period, a force with no antecedents definitely detectable in the statistical data before 1929.

Consider first the main movements, especially the trends, of the several series to the end of 1929.[2] The trend of the exchange-velocity index for 140 cities is nearly a straight line, and by the end of 1929 it had risen roughly 50 per cent above the value at the beginning of 1921. The same thing is true of industrial production. The car-loadings trend rises much less sharply and is slightly *convex* upward. The trend

[1] It is relevant to recall that the curve for circulating deposits (Chart IX, in Chap. II) has a somewhat different pattern of fluctuations around its trend. In addition, the deposits data show no sharp discontinuity at the end of 1929, although, for convenience in computing, the trend was actually broken at this point.

[2] The monthly velocity data are given in Table VI of the Appendix. The other series were also used in Chap. II, and their sources are described there. It will be recalled that the series for the money volume of stock sales is an estimate, and is presumably too high through most of its course.

for department-store sales looks very much like that for car loadings. The same thing is superficially true of the trend for construction contracts awarded, though reference to the scales of the curves shows that its *relative* rise was really a great deal sharper than the rise of the other series listed. The trend of factory pay rolls is heavily influenced by the large 1921–1922 fluctuation in these data, but a trend drawn to begin in 1923 would look like a less steep version of the industrial-production trend. There is thus a general resemblance between the velocity, production, car-loadings, and even pay-rolls curves, which entitles us to regard them from the present point of view as belonging to the same main group. The trends of the construction contracts and department-store sales curves also bear some resemblance to the trends of these other series, though the resemblance between the larger fluctuations around the several trends is slight. On the other hand, the trend for the estimated money volume of stock sales on the New York Stock Exchange is heavily concave upward, particularly after 1924. Hence it is entirely unlike the other trends, and is not nearly so closely associated as the first group with the comparatively uniform upward movement of the 140-cities velocity trend. Much the same thing is true of the trend for net new corporate-security issues, given on Chart XIX.

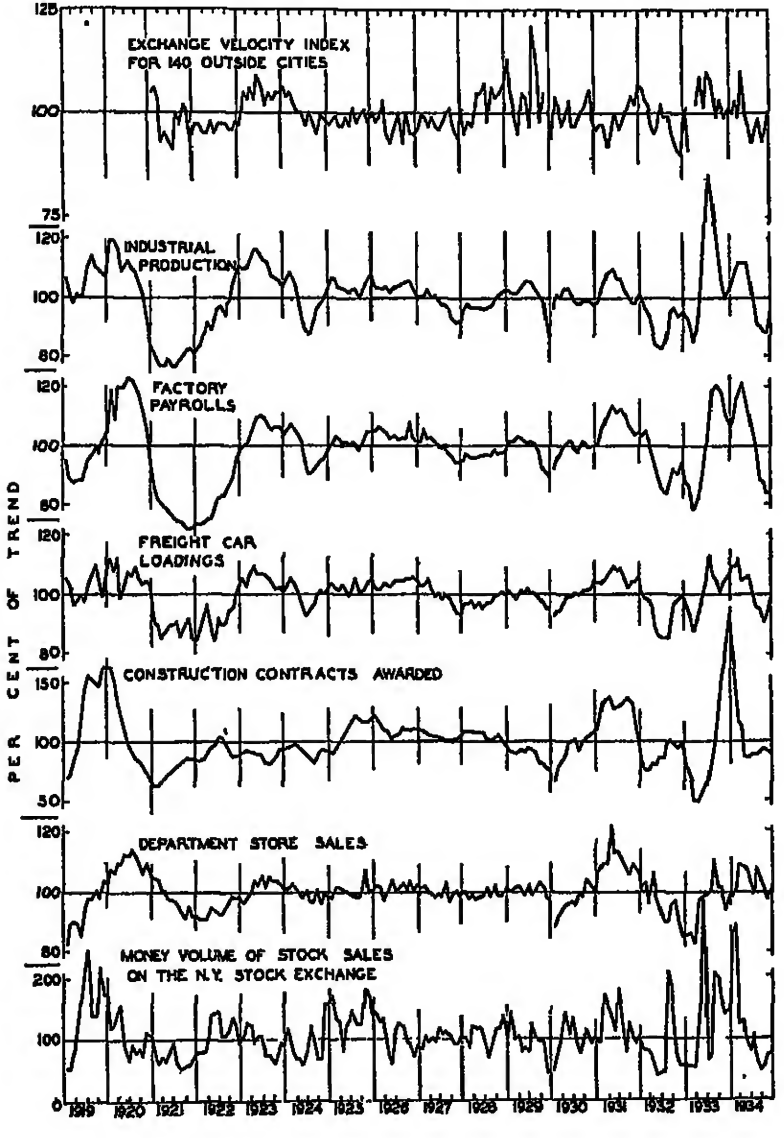
From the end of 1929 to the end of 1934, all of the original series except that for velocity (and perhaps that for stock sales) show a marked fishhook pattern, and all of the trends are markedly concave upward. As the data for future years are collected, however, it will undoubtedly become clear that this sharp fishhook (like that in 1920–1922) should not be allowed to dominate the computed trends themselves, and that the period from 1931 to 1933 or later was one of abnormal depression below anything that by, say, 1940 would seem to be a defensible "trend" for the aggregate period 1930–1940. It is extremely interesting to see that the

fishhook pattern does *not* appear in the 140-cities velocity data. The original velocity data and their computed trend continued to decline pretty well to the end of the period in 1934, whereas all of the other series except stock sales began a persistent rise after the bank holiday of March, 1933. The only trend here given which resembles the 140-cities velocity trend closely in the period 1930–1934 is the one for stock sales, though the one for new corporate-security issues given on Chart XIX also resembles it fairly well.

An examination of the "cycle-accidental" residuals, which remain after division of the seasonally adjusted original data for the several series by their respective computed trends, yields results that are roughly analogous to those given by the comparison of the trends themselves. The cycle-accidentals for the exchange-velocity index of 140 cities, and for the other series previously examined, are shown on the accompanying Chart XVIII. In judging the significance of these comparisons, however, the reader is asked to bear in mind the general observations on the computation of trends and of residual cycle-accidental fluctuations, which were made in Chapter II, Sec. III. The data presented on Charts XVII and XVIII again illustrate the need for caution, since by using trends fitted for slightly different periods, and even of only one or two higher degrees, marked differences would be produced in the pattern of the cycle-accidental fluctuations in velocity. The width of the cycle-accidental swings in 1932–1934 must also be treated with some circumspection, in view of the somewhat uncertain significance of the trends themselves in this period.

There is clearly a general resemblance between the cycle-accidentals for velocity in the 140 centers on the one hand, and those for industrial production, car loadings, and pay rolls on the other, in the period 1921–1929. But the relation

CHART XVIII.—CYCLE-ACCIDENTALS OF THE EXCHANGE VELOCITY INDEX FOR 140 OUTSIDE CITIES, AND OF OTHER SERIES, MONTHLY: 1919–1934



is less close than the similarity in the general paths of movement of the several series, considered above, might lead one to expect. At a number of points velocity appears to move with the other series, with some lag. But it contains certain fluctuations that do not appear clearly in the other series mentioned. The converse is also true. From 1921 to 1928, except in the middle of 1926, the velocity cycle-accidentals show a somewhat closer association with those of car loadings than with those of industrial production or factory pay rolls. But the rise in velocity in 1928 *precedes* that in car loadings; its 1928 and early 1929 peaks are not closely associated with car loadings at all; and the mid-1929 peak in car loadings is imperceptible in velocity. Nor are these 1928–1929 movements of velocity related to similar movements in any of the other nonfinancial curves. Their closest association in these two years is with the money volume of stock sales, given on the bottom curve.

As to the other curves, the pre-1930 association of velocity with industrial production is moderately close to 1925, is only intermittent in 1925–1928, and then breaks down badly in 1929. The same thing is true of factory pay rolls, after allowance for the much greater amplitude of the pay-roll fluctuations in 1921–1922. For construction contracts awarded, it is difficult to establish any relation at all, though a case can perhaps be made for the view that they lead velocity changes on the upturn in 1921 and 1924, and on the downturn in 1926. The association with department-store sales seems slight after 1924.

To summarize the period 1921–1929, these data indicate that up to 1928 deposit velocity in the cities outside of New York City moved in general with and sometimes a little after the broad measures of production and wholesaling activity, but that in 1928–1929 it was associated more conspicuously with security trading and (presumably) other "financial" transactions. After 1924, there was little

relation between deposit velocity and retail transactions as measured by department-store sales. These conclusions may be compared with the ones reached in Chapter II regarding the factors chiefly associated with the *quantity* of circulating deposits in the period 1921–1929.

The period 1930–1934 is more difficult to analyze. The two great factors in the period, of course, were the severe deflationary movement that ran to the first months of 1933 and the even sharper fluctuations in 1933–1934. These two factors produced such violent perturbations that, as previously suggested, one must question seriously the significance of any trends computed for merely the five-year period involved, and of any cycle-accidentals derived from them. Broadly speaking, however, with the notable exception of the latter part of 1931, the computed cycle-accidentals of deposit velocity for the 140 centers maintained the same general associations that they had shown in the earlier period. They moved most closely, on the whole, with car loadings, but were also fairly similar to industrial production and to factory pay rolls (exception again made for 1931).[1] Certain of their fluctuations, not accounted for by these series, are related to the movements of New York stock sales.

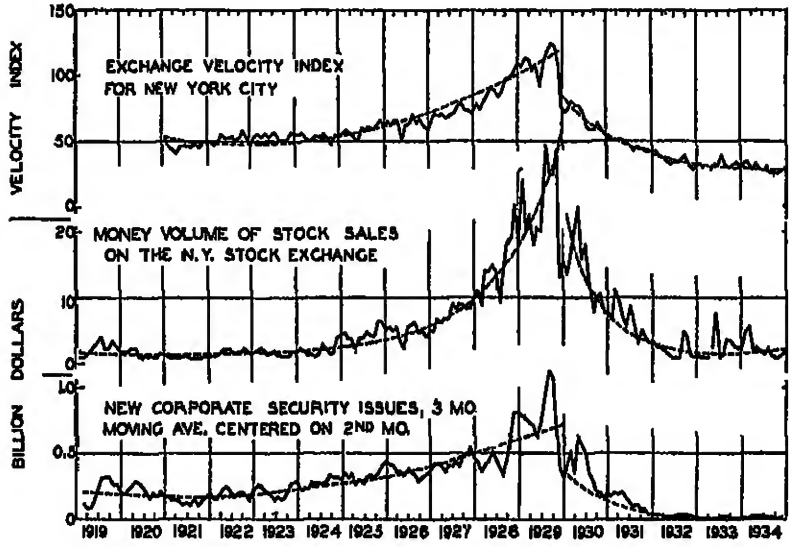
These comparisons of trends and cycle-accidentals have all been based on the deposit-velocity indices of the 140 cities outside of New York City. The velocity index for New York City itself, as previously remarked, has a pattern of behavior which is different in several important respects from that of the 140 outside cities. Its general amplitude of movement is greater; it is markedly concave upward on *both* sides of 1929; and, as will be shown in a moment, both

[1] The data here examined offer no explanation for the late 1931 rise in velocity, a rise which was also marked in absolute terms (see Chart XVII). Statistically, the rise is accounted for by the fact that in the latter part of 1931 deposits began to fall heavily, while debits remained fairly stable. See Chart XV.

its trends and its shorter fluctuations are apparently chiefly associated with "financial" transactions.

On the accompanying Chart XIX, which is analogous to Chart XVII, the seasonally adjusted deposit-velocity index for New York City is compared with similar series for the money volume of stock sales on the New York

CHART XIX.—THE EXCHANGE VELOCITY INDEX FOR NEW YORK CITY, AND OTHER SERIES, MONTHLY: 1919–1934



Stock Exchange and for net new corporate security issues. The latter two series are measures of the "financial" class of transactions, in contradistinction to the measures of production and exchange chiefly stressed hitherto. It is evident on inspection that the New York City velocity index is quite similar to these financial measures in its general path of movement and in the character of its trend, both before and after 1929; and that it resembles them much more closely than it does any of the other broad measures given on Chart XVII. This is particularly conspicuous with respect to the marked upward concavity in all three curves

on both sides of 1929 and with respect to the absence of the fishhook pattern in the original data for 1930–1934.

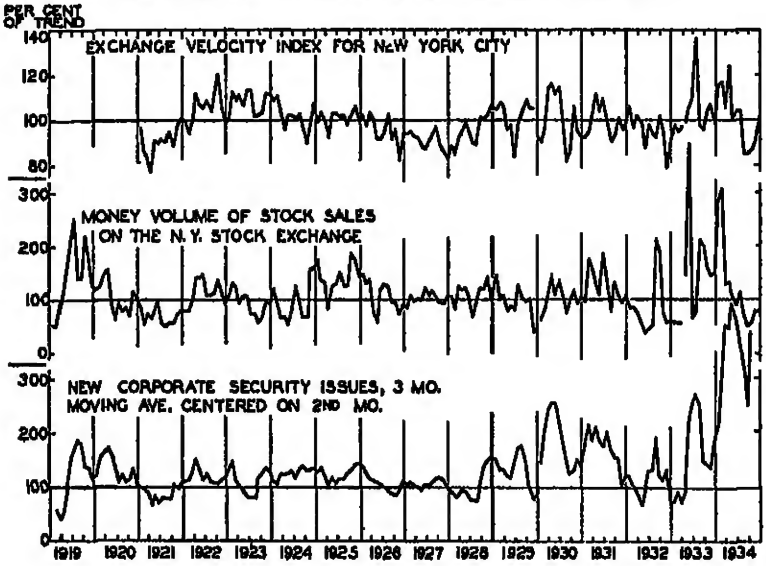
The cycle-accidentals of the three series (computed as before) are presented on the accompanying Chart XX. They give much the same picture. The general resemblance between those for velocity and those for stock sales is especially marked from 1924–1925, when the volume of stock sales began its meteoric climb, to the middle of 1931. In this period the two sets of movements are analogous at virtually every important point except the first part of 1927, and are nearly simultaneous.[1] However, the relation is less pronounced in 1921–1924 and in 1932–1934. These were periods when the volume of stock sales was relatively low. (It will be recalled that a similar decrease in apparent relationship with stock transactions was noted for the New York district deposit relatives, in Chapter III.) The relation between the New York City velocity index and the new-issues curve (three months' moving average) is not so close as the relation between the New York City velocity index and stock sales in 1925–1932, but it is still marked. It is much closer than that between the New York City velocity index and any of the broad production and exchange measures shown on Chart XVIII. Among the latter, the general association of New York City velocity with industrial production is perhaps closest; at the larger turning points sometimes production leads, sometimes velocity.

These charts demonstrate that the New York City velocity index was associated throughout most of its length with the rough measures of the volume of "financial" transactions here given, both in trend, in cycle-accidental fluctuations, and even, as previously noted, in its seasonal

[1] Stocks show an apparent lead of one unit (a month) at some points, but this may be due in part to the fact that the differences between the reporting weeks used as a basis were not adjusted for the present rather rough purposes. Debits and deposits, and therefore exchange velocities, are reported for weeks ending Wednesdays, the money volume of stock sales for those ending Saturdays.

movements. It was *not* associated closely with the production and exchange indices presented above. The velocity index for the 140 outside cities, on the other hand, was more closely associated at most points with these latter measures than with the financial group of transactions.

CHART XX.—CYCLE-ACCIDENTALS OF THE EXCHANGE VELOCITY INDEX FOR NEW YORK CITY, AND OF OTHER SERIES, MONTHLY: 1919–1934



Yet the line between New York City and the rest of the country should not be drawn too sharply. It is true that the New York City velocity index is closely associated with one group of factors, whereas the index for the 140 outside cities is associated, rather less closely, with a quite different group of factors—except in 1928–1929, when it too was associated chiefly with the financial group. But the velocity indices for New York City and for the outside cities are in turn quite closely related to one another, as shown on Chart XIV; this relation was less intimate for the respective trends than for the fluctuations within periods of a year or two. I doubt, however, if this can fairly be regarded as a

demonstration of any fundamental inconsistency in the preceding interpretations of the data and charts presented above. The New York City velocity index was *chiefly* influenced proximately by the volume of financial transactions, but it must also have experienced substantial indirect effects from changes in the volume of production and wholesale exchange—to which, after all, the financial transactions themselves must be closely, if indirectly, related. The velocity index for the 140 cities, in turn, was *chiefly* influenced proximately by the latter factors, but also experienced substantial effects from the financial factors, and in 1928–1929 it was apparently dominated by them. A complex process of action and interaction must have been at work between more or less common underlying causes and more or less common effects. New York City was not operating in a self-contained vacuum. Hence there should be nothing surprising in the fact that these profound interactions left the New York City and the outside-city exchange-velocity indices moving quite closely together. On the contrary, it would be surprising if the opposite situation had prevailed.

IV. SUMMARY

The principal results of this study of the exchange velocity of circulating deposits are as follows:

1. It was not found practicable to set up actual measures of deposit velocity itself for the country as a whole, partly because of the difficulty of interpolating from the weekly deposits sample, but chiefly because of the impossibility of extrapolating the weekly debits sample with any assurance from the data now available. The figures given are therefore merely approximative indices. It is believed that the indices adequately represent at least the shorter fluctuations of velocity, however, and that for the country as a whole the actual velocity figures averaged about 75 per cent of

the index values in 1921–1932 (about 89 per cent in 1933–1934). The New York City indices are presumably very nearly equal to the actual velocity figures, because for New York City the samples are nearly as large as their respective universes.

2. The New York City index is higher throughout its course than the index for the 140 outside cities, and it also rises and falls more sharply. The general paths of movement and the computed trends of the two indices are analogous, however, apart from this difference in amplitude, and the shorter fluctuations are quite similar. In both velocity series, the principal factor responsible for these short-period fluctuations is changes in debits, not changes in deposits.

3. A marked intramonth cycle exists in debits, and therefore in exchange velocity, since as a rule deposits are relatively inert over short periods. This cycle is not the same for all months.

4. The exchange-velocity indices show heavily marked seasonal fluctuations. These seasonals are much the same in general pattern for the 140 outside cities as for New York City, though there are substantial minor differences. They are also much the same for the period before 1929 as for the period after, though again with certain apparent minor shifts. This general seasonal pattern, both for New York City and for the 140 outside cities, is on the whole most similar to the seasonal patterns of the various measures of financial transactions. However, it also resembles what can be supposed to be the seasonal pattern of the aggregate of *all* money-using transactions, nonfinancial as well as financial.

5. A more detailed comparison of the larger movements of the exchange velocity index for the 140 outside cities with other series shows that there was a general resemblance through 1927 between this velocity index and the broad measures of production and wholesale exchange, and in

1928–1929 between velocity and financial transactions. But at no point after 1924 did velocity resemble the movements of retail transactions. Examination of the several cycle-accidental deviations from the computed trends yields similar results. In 1930–1934, the velocity trend for the 140 outside cities resembled that in financial transactions quite closely, but was unlike that of all the nonfinancial series. The cycle-accidentals in this latter period are of rather doubtful significance, because the period is short and because of the highly abnormal events that characterized it. The velocity cycle-accidentals, however—in contrast to the velocity trend—seem to show the same general associations with production and wholesale exchange that had been maintained in the period before 1928.

6. Similar comparisons of other series with the exchange-velocity index for New York City alone show that both the trend and the cycle-accidentals for New York City velocity are much more closely associated with those of financial transactions than with those of the nonfinancial measures. This is true both before and after 1929.

7. It is thus evident that deposit-exchange velocity as a whole reflects, naturally enough, the resultant of the actions and reactions of a complex group of factors which are really limited only by the boundaries of the national economic life. Exchange velocity is not itself a simple thing, nor can it properly be associated with any other one element taken alone. The exchange-velocity index for the 140 outside cities was chiefly associated statistically, to the end of 1927 and probably (but less clearly) in 1930–1934, with the various measures of production and wholesale exchange. On the other hand, the exchange-velocity index for New York City throughout nearly all its length, and the velocity index for the 140 outside cities in the period from late 1927 to 1930, were chiefly associated statistically with changes in the money volume of what we have called "financial"

transactions. But these financial transactions in turn ultimately gain their life blood chiefly from the underlying production and exchange operations with which we have here, for convenience in exposition, so sharply contrasted them. A rise in the latter entails a rise in the former, other things being equal—sometimes with a lag, sometimes with an apparent lead. A decline in the volume of production and exchange may be accompanied for a time by a speculative or even a panicky *increase* in the money volume of financial transactions; but soon the latter too will fall. Exchange velocity, with differing emphases under different circumstances, mirrors merely the aggregate of all these different types of operation. No single sharp line of "causation" can be drawn between velocity and other factors. The relations involved are part and parcel of a highly interconnected, sensitive, organic complex, in which, because of defective data, the whole sometimes seems to be greater than the sum of the parts.

8. The bearing of these findings on general monetary analysis is clear, and need not be elaborated. They provide, *albeit in tentative fashion, a not insubstantial groundwork* of facts and inferences on which to build broader types of generalization, and against which to test the relevant parts of existing theories. They also have an evident bearing on some of the more recent proposals for monetary control. One is the proposal to vary bank reserve requirements with the exchange velocity of deposits, in the interests of general stabilization. So far as exchange velocity is concerned, an initial difficulty manifests itself at once. Exchange velocity appears to move with or after other important factors, not before them. The seeds of disturbance are therefore likely to have become too deeply imbedded for successful extirpation before action based on exchange velocity alone can become effective. A further difficulty lies in the implicit assumption that increased reserve requirements will induce

a contraction of deposits instead of merely an increase in rediscounting, and especially that a contraction of deposits will correct an "unhealthy" situation in any reasonably short period. The studies of deposit movements and their associations, made in Chapter II, perhaps do not refute this latter assumption, but they certainly lend it no clear support. The difficulties with the converse propositions concerning the encouragement of expansion are even more manifest and more serious.

The actual movements of the exchange-velocity indices for circulating deposits also raise doubts as to the practicability and the usefulness of Professor Hayek's not wholly dissimilar proposal for stabilizing the product term, money times exchange velocity.[1] If the proposal is taken to apply to short periods of, say, a few weeks, the actual amplitude and frequency of the short-period fluctuations in deposit-exchange velocity are so great that it would be difficult, from merely the technical standpoint, to make the required inverse adjustments in the quantity of deposits with sufficient promptness and accuracy to leave the actual product term substantially constant. If the proposal is applied to longer periods, a different and more serious problem presents itself. It will be recalled that, even for the country as a whole, the longer movements of the exchange-velocity index, as well as many of the shorter fluctuations, derive a substantial part of their characteristics from the movements of the money volume of financial transactions.

It is hence possible and even quite probable that adjustments in the quantity of money, which are based (inversely) on the fluctuations of the exchange velocity of deposits, will be governed in marked degree, and at times even predominantly, by (inverse) fluctuations in the volume of financial transactions. But, as adequately shown by the preceding charts, the volume of financial transactions is

[1] F. A. Hayek, "Prices and Production" (2d ed., 1935), p. 124.

very far from moving closely with the various broad measures of nonfinancial economic activity already examined. Consider both the trends and the shorter movements of the several curves. It is hence also possible and even probable that at times the adjustments in the quantity of money which Hayek proposes will be indifferently related or even inverse to those which the current movements of nonfinancial economic activity would seem to require.[1] Finally, the financial transactions themselves presumably use relatively little money per unit time period and per dollar of their own volume (that is, the exchange velocity of the money used is presumably high), and they thus seem unlikely to be particularly susceptible to the effects of artificially enforced changes in merely the *quantity* of money itself.

The significance and desirability of forcing adjustments in the supply of money used by the country at large, which are caused to be inverse to the current exchange velocity of the money, must therefore seem rather questionable. The evidence available, though not conclusive, casts doubt on the practical workability of the proposal and suggests that it might even operate to "stabilize" the wrong things.

[1] Thus a control policy which attempted to stabilize the product term, quantity of money times its exchange velocity, would have compelled an especially severe contraction of deposits in the latter part of 1929. It can be contended with some force, as a number of writers have done, that, since most branches of nonfinancial activity had already turned definitely downward by or before the middle of 1929, this policy would have been exactly wrong—that deposit *expansion* and money market ease were called for. The not infrequent tendency of the volume of financial transactions to expand temporarily in response to speculative factors, on sharp *downturns* of nonfinancial activity, also furnishes some embarrassment to the type of control policy here in question. Finally, it is in point to recall that over half of all debits in the 141 centers series on the average, and probably nearly one half for the whole country, are the debits of New York City alone.

Chapter V

THE CIRCULAR VELOCITY OF MONEY AND OTHER FACTORS

I. CIRCULAR VELOCITY, NATIONAL INCOME, AND THE STOCK OF MONEY: SOME GENERAL CONSIDERATIONS

IT IS a familiar truism that, except for the usually unimportant phenomenon of hoarding, the possession of money is merely a means to an end, not an end in itself. People sell goods or their own services for money, in order that with the money received they may purchase other goods and services. Such is the teaching of every elementary textbook.

This truism carries with it a corollary proposition which is almost equally important, yet which is often overlooked. If we place ourselves at the point in the total flow of economic activity which is occupied by the individual consumer, and try to picture the physical movements through space of specific units of money—whether currency or bank deposits—it becomes evident that the great majority of these specific movements must have an essentially circular character. Suppose that a particular block of money is initially paid out, for example, by an individual who is buying consumers' goods or services. The retailer in turn may at once pay out some of this money to meet his own wages bill, but ordinarily he will use most of it to pay the wholesaler. The wholesaler in turn uses most of his receipts to pay the manufacturer, who in turn uses part of his receipts to pay wages, salaries, and other individual incomes, but also uses part of them to buy his raw materials or machinery or for other purposes. It is clear that all or nearly

all of the particular block of money which is originally paid out by the consumer will eventually be paid back to him or to other consumers, in return for services (including saving) rendered to the producers.[1] It is also clear, however, that this return flow will usually take some little time. Part of any one block of money originally paid out by consumers may return to the consumers in the aggregate almost at once, but part may not return for several months or even years. The time period required by an *average* unit of money to complete an *average* consumer-producer-consumer circle is likely to be substantial. We shall also present indirect evidence later to suggest that this average time period is usually of fairly stable size.

The reality and the significance of this circular movement of money are not, if seems to me, open to question. I think that the concept itself is fundamental to an understanding of the monetary and exchange processes of society as a whole. If the movements of the largest part of the money stock were not essentially "circular" in this (nongeometric) sense, every new act of production and sale for money would require the creation and use of a new block of money. At the same time, producers or consumers or both would continually pile up stocks of money, created previously to carry on previous production operations, but now held idle. Actually, of course, this does not happen. The great bulk of the money stock is used over and over, in an endless succession of such payment operations. It is, in a sense, an endlessly revolving fund. Any one unit of money passes first from consumers in the aggregate to producers and dealers in the aggregate, and then, sometimes rapidly but sometimes slowly, it flows back again to the aggregate body of consumers as individual incomes. And so on indefinitely, unless at some point the particular unit of money

[1] Note that the individual consumer may himself be a producer of consumers' goods.

chances to be extinguished. The *average* number of these consumer-producer-consumer circles, which the *average* unit of money completes per unit time period, is the *average circular velocity* of the money stock.[1]

To repeat, this general conception of the main movements of the money stock as being essentially circular seems to me fundamental. The conception is not applicable, however, to *all* money-using transactions; one substantial limitation must be placed upon it. The movement of money is circular

[1] I have examined the concept of circular velocity at greater length in an article in the *Quarterly Journal of Economics* for November, 1933. This concept has been familiar for many years in monetary theory. Certain students, however, have rejected it entirely. Professor Keynes, in his "Treatise on Money" (1930), Vol. II, p. 24, characterizes it as "a hybrid concept." I should agree with this condemnation if the concept were taken as relating to *all* types of money-using transactions. But what have been called "financial" transactions in other chapters, especially those involving dealings in previously existing rights and claims, clearly stand on a different footing from those involving, for example, the direct production and exchange of consumers' goods. As shown in subsequent paragraphs, most of these financial transactions (and the money currently used in them) are irrelevant to the concept of circularity in the movements of money; the movements of money through the successive payments involved in such transactions are *not* necessarily circular. The purely "financial" classes of transactions are therefore excluded below, in setting up the logical and the statistical categories that enter into the definition of the circular velocity of money. This exclusion removes the "hybrid" quality to which Keynes objects, and which necessarily inheres in any comparison of the *total* supply of money with the *total* volume of money-using transactions of all sorts. It is removed, at least, except to the extent that almost any summation or average of large masses of economic phenomena is in a sense a hybrid, because of the wide differences in the types of events or operations that have usually contributed to the phenomena in question (*e.g.*, price indices, even for small groups of commodities).

Some students have used the term "income velocity" to describe the magnitude here called the "circular velocity of money"; see, for example, Lauchlin Currie, "The Supply and Control of Money in the United States" (1934), p. 6. The term "income velocity," however, seems to me to be inaccurately used here. The actual phenomenon which both terms attempt to denote is a certain type of behavior *of the money stock*, not the behavior of *income* as such. Indeed, I think the term "income velocity" should properly be used only to describe (reciprocally) the interval between the receipt and the expenditure of a given block of income. The average size of this interval is one factor, but only one of several which determine the "circular velocity of money" as here defined.

For a much more detailed description of the stages and processes involved in the essentially circular movement of the great bulk of the money stock, see E. F. M. Durbin, "The Problem of Credit Policy" (1935), pp. 31 *ff. et passim*. This lucid and most suggestive study came to my attention only after the present book was in press.

only insofar as the money stock is used to make payments (in the opposite direction) for the unidirectional forward flow of goods and services *from* natural resources and human effort, including abstinence, *to* consumers' finished products. This stream of money payments, of course, constitutes much the largest proportion of all the money payments in any modern society. It includes all payments made for the fabrication, distribution, and final sale of finished consumers' goods and services, and for the extraction and distribution of the raw materials and the machinery used in their production. Some fraction of every dollar spent by the consumers, or its equivalent, eventually finds its way back to the farthest beginnings of the aggregate production and exchange process, except insofar as producers and dealers may default on their liabilities. The stream also includes payments for the production of such things as railroad bridges and power lines, which contribute to the flow of consumers' goods and services only at one or more removes; payments for interest, dividends, and other earnings of capital and enterprise; and taxes paid to governmental bodies—which are perhaps the most important single class of producers of consumers' services. Finally, it includes the operations involved in the saving and investment of money, considered below. These latter operations provide the principal channel through which abstinence is brought into the aggregate production and exchange process, and through which it affects, directly or indirectly, the current flow of consumers' goods and services. In all the various possible sequences of all of these payment transactions, the flow of the money stock is essentially circular, from consumers to one or more of the various classes and levels of producers and dealers, and thence back to consumers.

The flow of money is not necessarily circular, however, with respect to the great majority of the payment transactions which in earlier chapters we have loosely described as "financial." It is not necessarily circular with respect to

dealings in *previously existing* rights, claims, and titles—chiefly in existing securities, land apart from new improvements, and certain commodities traded in speculatively. Such dealings usually have nothing to do with the unidirectional flow of goods and services just now referred to. Two men could trade given blocks of securities and of money back and forth between themselves indefinitely, and could thus pile up a tremendous recorded money volume of transactions. But neither the size of this total money volume of transactions nor the movements through space of the money used would have any particular significance for the current unidirectional flow of goods and services or for the general national welfare—except to the extent, usually small, that these operations deprived other types of economic activity of needed supplies of money. Most of the financial classes of transactions are simply whirlpools at the side of the main flow of payments for the production and exchange of goods and services. Such financial transactions, and the money currently used in them, must therefore be excluded from the range of monetary phenomena to which the concept of circularity is applied.[1] Only new saving and investment and the money used in them, among the financial transactions, should be included. It also follows as a corollary that, when we describe the movement of money through the production and exchange process as essentially circular, and say that the units of money paid out by consumers in the aggregate come back to the consumers in the aggregate in the form of individual money incomes, we implicitly define those incomes in a particular way. We define them to include all the money incomes arising out of the expenditure of human effort or abstinence, but exclude all capital gains and losses.

[1] Commodities and other things, of course, can also be traded back and forth in the same fashion as the securities just described, without advancing on their path to the ultimate consumer; this happens in a large part of the transactions on organized commodity exchanges. Here again, the movements of money through such transactions are not and cannot be "circular."

This exclusion of most financial transactions might appear to place a very serious limitation on the range of practical applicability of the concept of the circularity of money movements. In point of fact, however, such transactions probably amount on the average to not more than 10 or 15 per cent of all transactions that require an actual exchange of currency or bank deposits. (This estimate is based on a comparison of bank debits with rough measures of the volume of financial transactions, after allowance for such offsets as stock clearings.) The concept of the circular movement of money, and of its circular velocity, is therefore probably applicable to some 85 to 90 per cent of all money-using transactions.[1] Thus there is no question about the material significance of the concept as gauged by the area it covers.

In the present chapter we shall examine the available statistical data bearing on the numerical size of the circular velocity of money and on the behavior of this velocity, and shall indicate briefly the relations of circular velocity to certain other major economic factors. No direct measurement of circular velocity is now possible. A fairly satisfactory indirect measurement can be obtained, however, by taking advantage of a simple relation. Let the size of the money stock be M. Let the average annual circular velocity of this money stock, or the number of consumer-producer-consumer circles completed per year by the average unit of money, be C. We can most conveniently measure this average number of circles per year at the point in the average circle where consumers *receive* their money incomes.[2] For this purpose "incomes received" is defined to include both incomes

[1] The relation of circular velocity to exchange velocity, and therefore to the totality of all money-using transactions, is explored further in Sec. IV. See especially the footnote on p. 150.

[2] Measurement of the circular movement of money at any other point in the average circle would probably complicate the theoretical analysis of circular velocity, and in addition is impossible in terms of the statistics now available.

received in currency or deposits by the individual himself and incomes received and held for his account by agents, as in the case of increases in corporate surpluses and other business savings. As already indicated, however, capital gains and losses and the like should be excluded. Let the national total of money incomes thus received by individuals be *NI*. Then, if the general economic situation is fairly stable, it is roughly true that[1]

$$M \times C = NI,$$

or

$$C = \frac{NI}{M}.$$

If hoarding or dishoarding occurs, the commonest examples being "saving" and "investment" in the ordinary sense, or if other substantial and rapid changes are taking place in the factors here involved, lags and leads will be introduced which will upset the numerical equality of this expression. The distortions will usually be temporary, however, and not large in relative terms.[2] Except with respect to unit time periods which are only a few months in length or less, the equation is sufficiently accurate to be useful.

Numerical values for *C* can be obtained from this expression without difficulty. For the national money income, three principal estimates are available which cover parts of the period 1909–1932. Estimates on *M* were presented in Chap-

[1] For a fuller statement of the considerations that support this equation, see my article on Money, Prices and Production: Some Fundamental Concepts, *loc. cit.*

It is evident that the national money income as here defined, minus current increments of saving, other hoarding, and the like, and plus an allowance for the effects of current increments of dishoarding and the like, is equal to the current national money volume of expenditures on finished consumers' goods and services.

[2] I hope to demonstrate this more fully in an article now being prepared. It appears probable that the delay or lag in the transmission of changes is ordinarily not greater than a few weeks, while the maximum possible lag is usually one-half the period measured by the reciprocal of *C*. The distortion produced by these lags in the *annual* numerical estimates presented in the next section is not likely to be large, since the annual value of *C* is usually greater than 1.

ter II. The above expression can then be solved for C; this will be done in the next section.

It is evident, however, that the values thus obtained for C are simply the national *average* values, and are presumably an average of quite dissimilar components. The circular velocity of money almost certainly differs substantially between different types of economic activity, and therefore also between different regions. To the extent that farm populations are also buyers of farm products, for example, a given unit of money passes from such farm consumers to farm producers and back to farm consumers perhaps only once a year, since the leading crops are largely annual. But for industrial populations buying manufactured goods, many of which have a much shorter production period, the analogous circular movement will usually be much more rapid. The national average will then lie somewhere in between.[1]

Incomes not received and spent in money, of course, should not enter into the figures. "Incomes" which really represent capital gain and losses and the like are also excluded as far as possible from the national income data, for reasons previously given. Business and individual savings, it will be recalled, are included.

II. THE BEHAVIOR OF CIRCULAR VELOCITY, 1909–1932

Estimates of the national money income are available for various parts of the period 1909–1932. Numerical values for the circular velocity of money can therefore be obtained on an annual basis, as just indicated, by dividing these national income figures by the figures on the stock of money presented in Chapter II. The resulting values are of course averages, and are also not exact when substantial changes are taking place in the magnitudes involved, but for reasons

[1] Actually, of course, the determining factors are substantially more complicated than this suggests, but no attempt will be made to work them out here. Allowance must also be made for the effect of exchanges *between* farming and industrial regions, and the like.

already indicated it is believed that they are sufficiently accurate to have definite significance.

On the accompanying Chart XXI, numerical values for circular velocity are presented, which are calculated on several different bases. The lower group of curves, marked C, are obtained by dividing the national income estimates by the figures for "total" money as previously defined, namely, outside currency plus total demand, savings, and time deposits, minus duplicating items, all on the June call dates.[1] The C curves therefore give the annual circular velocity of "total" money, as calculated from the several national income estimates. The upper group of curves, marked C_1, are similarly obtained from the figures for "circulating" money as previously defined, namely, outside currency plus demand deposits minus duplicating items, or "circulating" deposits. From 1909 to 1918 the figures used are again those for the June call dates. From 1919 to 1932, however, the figures used for circulating money are averages of the estimated monthly figures previously presented;[2] these averages are somewhat more representative than the June call-date figures. The C_1 curves thus give the annual average circular velocity of "circulating" money. In calculating both C and C_1, three different sets of estimates of the national income were used: for 1909–1928, King's figures;[3] for 1913–1928,

[1] Data given in Table I of Appendix B, col. 8.

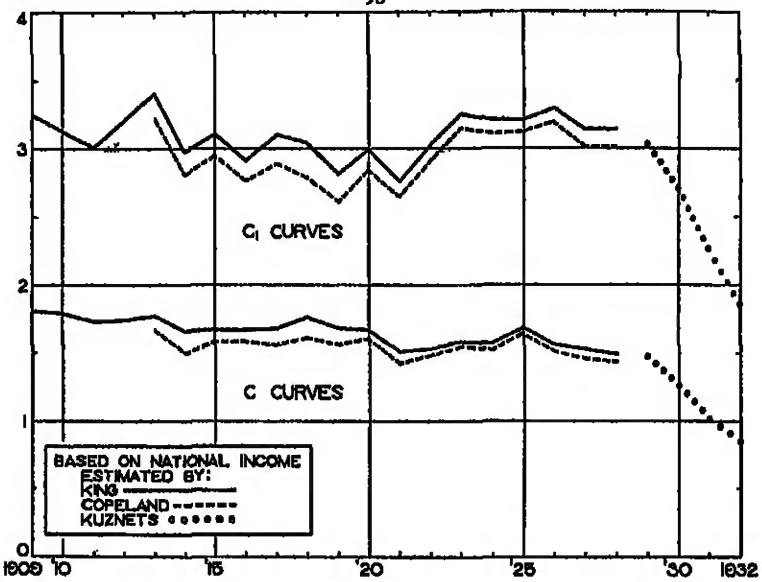
To be strictly accurate, the sums of money currently tied up in the bulk of the financial transactions previously referred to should be subtracted from the several figures on the stock of money, since these financial transactions are not a part of the circular flow of money payments and of the money stock. No direct measurement of the sums thus currently tied up is available. Comparison with the data presented in Chap. II suggests, however, that the absolute quantity of money tied up in financial transactions must be comparatively small. On this see later sections, especially Sec. V, paragraph 4. The error entailed by failing to make this correction is therefore presumably also small. The error operates to make the numerical values of circular velocity as here derived slightly too low.

[2] Data given in Table II of Appendix B, cols. 1 and 2.

[3] W. I. King, "The National Income and Its Purchasing Power" (1930), p. 74; "imputed" income is excluded.

Copeland's;[1] and for 1929–1932, Kuznets' figures.[2] King's and Copeland's figures differ somewhat in absolute magnitude, but they fluctuate closely together. Because of defects

CHART XXI.—THE AVERAGE CIRCULAR VELOCITY OF MONEY, ANNUALLY: 1909–1932



in the materials from which they are derived, all three estimates appear to contain certain items that it would be desirable to exclude for the present purposes if such an exclusion were possible. They are adequate, however, to show the general character of the relations involved.[3]

[1] M. A. Copeland, The National Income and Its Distribution, in "Recent Economic Changes" (1929), Vol. II, p. 763, using his "money income."

[2] Simon Kuznets, "National Income, 1929–1932" (1934), p. 10, using his "income produced." This includes business savings, which under the definition given in the last section are a part of national income received.

[3] The values obtained for C_1 from Copeland's national income estimate differ somewhat from those given by Dr. Currie, *op. cit.*, p. 6*n*. Currie attempted certain adjustments in Copeland's estimates and also used somewhat different estimates for "circulating money"; on the latter differences see the notes to Tables I and II in Appendix B. Currie began his computations in 1921, and therefore stressed the

The C curves, showing the circular velocity of the total stock of money, are roughly only half as high as the C_1 curves because total money includes time and savings deposits, which were roughly half of this total in the period examined, whereas circulating money excludes them. The fact that the proportion of time and savings deposits to the total was rising fairly steadily gives the C curves a downward bias compared to the C_1 curves. This bias is not significant for the present study. The C_1 curves, showing the circular velocity of circulating money alone, are therefore the group of chief interest.

There are two especially striking things about the C_1 curves. One is the high degree of stability in the value of C_1 which they demonstrate during the years 1909–1929, a stability maintained despite the tremendous monetary and general economic perturbations of the period. The second is the evidence which the curves offer that the more severe phase of the depression which began in 1930 was a phenomenon of most unusual character.

A complete interpretation of the comparative stability of C_1, the circular velocity of circulating money, from 1909 to 1929 lies beyond the province of the present study.[1] The general hypothesis that to me seems plausible—partly for reasons that cannot be presented fully here—may properly be indicated, however. It is as follows: First, there is ground for thinking that the general level of this circular velocity C_1 is determined chiefly, under ordinary conditions, by the general monetary and payment habits of individuals and

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apparent "rising trend" from 1921 to 1928; had he run his figures back farther, he would have obtained a rather different impression from them.

Since Kuznets' estimates are not completely comparable to King's, though derived in large part from a wider use of the same sources, the curves are broken at 1928–1929. Copeland's estimates are based on a revision of King's; they are somewhat lower, but for the present purpose they tell substantially the same story.

[1] See my article in the *Quarterly Journal of Economics*, November, 1933, for a fuller outline of such an interpretation.

business firms at large: by the frequency with which they make payments, by the frequency with which they receive their own individual and business incomes, by the extent to which the various payment and expenditure schedules overlap, and by similar factors, including indirectly the character of business organization and the complexity of production and exchange processes. One would expect these factors to change only gradually, and the maintenance of a quite high degree of stability in the values of C_1 over time is consistent with this expectation. In the period 1909–1929, a very nearly horizontal trend would evidently give a defensible fit for the data.

Second, however, a different factor is also in play, and one which would be expected to produce substantial year-to-year fluctuations in C_1. This factor may be described loosely as changes in the size of "idle" balances held, especially those held by business enterprises. Any individual or business income which is kept by the receiver longer than *what is for him the "ordinary" average interval between* receipts and expenditures can be described as constituting such an "idle" balance; this definition is rough, but it is adequate for the present purpose. When business activity seems to be reaching a peak and is expected to fall off, business enterprises are likely to try to conserve their cash resources and, as far as possible, to build up their cash positions. They will refrain from undertaking plant expansions and other new investments; they will reduce orders to their suppliers; if a marked downturn actually develops, they will reduce dividend and other equity-earning payments, pare down depreciation and maintenance accounts, etc.[1] They try, in other words, to reduce the flow of their

[1] Studies by the National Bureau of Economic Research show that inventories of manufacturers often continue to *increase* to the end of the general business contraction. This indicates that we must look elsewhere for the nonmonetary counterpart of the increase in the relative size of "idle" balances: presumably to depreciation, maintenance and expansion accounts, and perhaps to distributors' inventories.

outlays relative to the flow of their receipts. So far as they are successful in this endeavor, they accumulate increased balances of cash, which in effect are currently held idle.

Similarly, individual consumers who are foresighted will attempt to reduce their outlays relative to their current receipts, though presumably their average range of freedom in this respect is narrow, and in particular will postpone the investment of savings. On both counts, the net effect is to reduce the intensity or frequency with which a given average unit of money is currently used. It is true that in periods of declining business activity the size of the stock of circulating money is likely to fall; this fall, because it is more spectacular and is easily seen, obscures the other changes that are going on. But, to repeat, the intensity or frequency with which the remaining stock is used likewise declines. In other words, individuals and business firms hold the average unit of money for longer periods, between its receipt and its expenditure, than previously. Under the definition suggested at the beginning of this paragraph, they are increasing their currently "idle" balances, relative to the size of the total money stock. When business activity picks up again, on the other hand, substantially the converse of these processes develops, and the relative size of the balances currently held "idle" diminishes.

The relative size of idle balances may thus be expected to fluctuate fairly closely with general business activity, and inversely with it.[1] Abstracting from changes in the stock of money itself, however, it follows that, as the relative size

[1] These statements are to some extent misleading, since they ignore the fact that increased "idle" balances of circulating money may pass into time or savings deposits, thus disappearing from the stock of circulating money. So far as this happens, other things being equal, the circular velocity of the remaining stock of circulating money C_1 will then remain unchanged. But the circular velocity of the stock of *total* money C will fall equally in either case. The fact that the amplitude of the year-to-year fluctuations in C_1 is actually greater than that for C suggests that the conversion of idle balances of circulating money into time or savings deposits (or the reverse) is either negligibly small in quantity, or at least is completely outweighed by other factors operating on C_1.

of the idle balances rises, the *average* circular velocity of money will fall, since the velocity of an increasing proportion of the stock is zero; the converse is also true. Circular velocity itself would therefore be expected to fluctuate *directly* with business activity, so far as it is governed by the size of idle balances. Inspection of Chart XXI shows that the movements of the data are again fairly consistent with this latter expectation, though the fact that the data are annual prevents any close testing.[1]

This double hypothesis provides possible clues to a number of features of the actual movements of C_1, as reported on Chart XXI. From 1909 to 1921, the yearly fluctuations correspond fairly well with the known increases and decreases in business activity. The persistent downward movement during the period, amounting to about 15 per cent, can be regarded either as indicating that production and exchange processes were becoming longer and more complicated, thus increasing the effective intervals between payments and lengthening the actual time distance from consumer to producer and back to producer, or as indicating that individuals and firms were holding a somewhat larger proportion of "idle" cash balances than before. There is something to be said for each view; the data available do not justify any selection. The absence of any marked effect, either from the introduction of the Federal Reserve system or from our participation in the war, is especially noteworthy. The wartime expansion was evidently carried out almost entirely by increases in the *stock* of money, not by a rise in its circular velocity.

The marked rise in C_1 between 1921 and 1923 is to be explained in part by the rapid recovery from the brief but sharp depression in business activity in 1920–1921,

[1] Compare the curves shown on Chart IX for the period beginning in 1919 (monthly data). On the whole, the fluctuations in C_1 seem to resemble most closely those in industrial production, except in 1928–1929.

and probably also in part by the hand-to-mouth buying campaign inaugurated at that time. The second factor would also account for the maintenance of C_1, after 1923, at levels substantially higher than had prevailed in the previous decade. The small peak in 1926 corresponds to a similar movement in some of the major economic indices previously examined (see Charts IX and X). It should be observed, however, that the tremendous expansion in the stock of circulating money between 1922 and 1927 is paralleled only in small degree by the movements of circular velocity. The slight decline in C_1 from 1926 to 1929 presumably reflects in part a gradual increase in the holdings of literally "idle" balances, as corporations accumulated from security flotations cash they could not fully use and as business activity neared its peak. In part, also, it probably reflects the use of increasing amounts of money for purposes other than the current production and exchange of goods and services, particularly for security speculation. Increased payments for such operations tie up increased quantities of money at any one moment in the payment mechanism, sums which, while being thus transferred, are not available for other uses.[1] The actual increase in the national money income from 1926 to 1929 (see Chart XXII) while C_1 was declining was made possible by a more than offsetting increase in the *quantity* of money.

Finally, the drastic fall in C_1 after 1930 must clearly be explained chiefly in terms of hoarding, both of currency and of deposits held in what were supposed to be the stronger banks, as the wave of bank failures began to grow. The mere progressive slackening of business would of course account for some decline in C_1, and doubtless a lengthening of the average intervals between payments because of

[1] Strictly speaking, such funds should be counted in with other "idle" balances, that is, with funds not being currently used in the production and exchange of goods and services.

business difficulties also contributed. But these were almost certainly minor factors compared with the effects of hoarding. It will be recalled that the quantity of circulating money fell rapidly after 1930, but the national money income fell still more rapidly. As a result, C_1 fell by 39 per cent in four years, a decline unprecedented in the period of almost a quarter century here under review.

This survey of the fluctuations of the estimated numerical values of C_1 *from 1909 to 1932 does not, of course,* "prove" the validity of the double hypothesis suggested a few pages above. It seems worth emphasizing, however, that the fluctuations described are consistent with this hypothesis, and that no other equally satisfactory explanation seems available to account for the apparent statistical facts.

III. NATIONAL INCOME, 1909–1932: VARIED CHIEFLY WITH THE STOCK OF MONEY, NOT WITH CIRCULAR VELOCITY

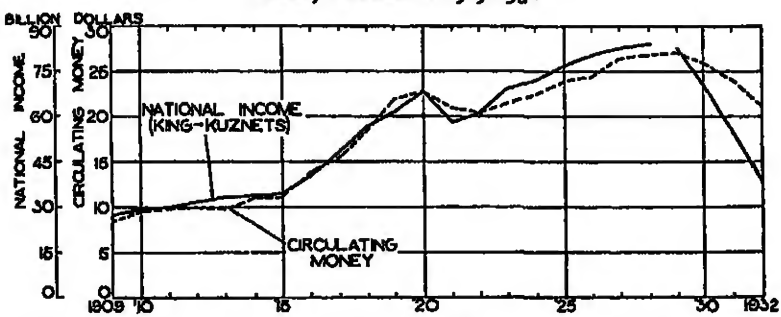
The very stability of circular velocity from 1909 to 1930 suggests that the tremendous increase in the national income during that period must have been associated chiefly with the increase in the money stock, not with any persistent increase in circular velocity itself. The accompanying Chart XXII forcefully demonstrates the actual closeness of the statistical relation, on an annual basis, between national money income and stock of circulating money.[1] To 1930 the general paths of the two curves, and particularly the relative amplitudes of their major changes, are very nearly identical. The fluctuations in circulating money lag a little behind those in national income in 1913, 1915, and perhaps 1926, and more conspicuously in 1922, but those are the principal differences. Had total money been

[1] King's and Kuznets' estimates for national income are used; see the notes accompanying the preceding chart. The data are given in Table VIII of Appendix B.

used instead of circulating money, an analogous but less close relation would have been shown.[1] From 1930 to 1932, however, the paths of national income and circulating money are substantially different. Both fell heavily, but national income fell relatively much farther, with the result, as shown in the preceding section, that circular velocity also fell heavily for the first time during the period under consideration.

A somewhat different story is told by the accompanying Chart XXIII. This chart shows the percentage *changes*

CHART XXII.—NATIONAL MONEY INCOME AND THE STOCK OF CIRCULATING MONEY, ANNUALLY: 1909–1932



from year to year in national income, the stock of circulating money, and the circular velocity of this stock in 1909–1928. Here again the national income is seen to be associated more intimately with the stock of circulating money than with circular velocity. But the association between national income and money stock was much less close with respect to these year-to-year changes than it was with respect to the general paths of movement of the two curves. The closest associations of year-to-year changes in national

[1] The figures for total money, as previously remarked, are influenced by the changing ratio of time and savings deposits to total deposits, a ratio which in general has been rising. The closer association between national income and circulating money affords further evidence that the latter category is more significant as an index of general economic activity than total deposits. If it were possible to isolate statistically the "active" money referred to in Chap. I, its association with the national income would undoubtedly prove to be even more intimate.

income are more evenly divided between changes in the money stock and changes in the circular velocity of this stock. Year-to-year changes in the national income were positively associated with year-to-year changes in the money stock in 15 out of the 19 cases, or 79 per cent. They were positively associated with year-to-year changes in circular velocity in 9 out of the 19 cases, or 47 per cent. In 3 cases, or 16 per cent, national income was inversely associated with the money stock, and in 1 case, or 5 per cent, it was substantially indifferent. The corresponding figures for circular velocity are 7 cases (37 per cent) and 3 cases (16 per cent).[1] In the period between 1929 and 1932, however (not shown on Chart XXIII), the national income declined 52.5 per cent, the money stock only 22 per cent, and circular velocity 39 per cent. In this period the changes in national income were more closely related to those in circular velocity.[2]

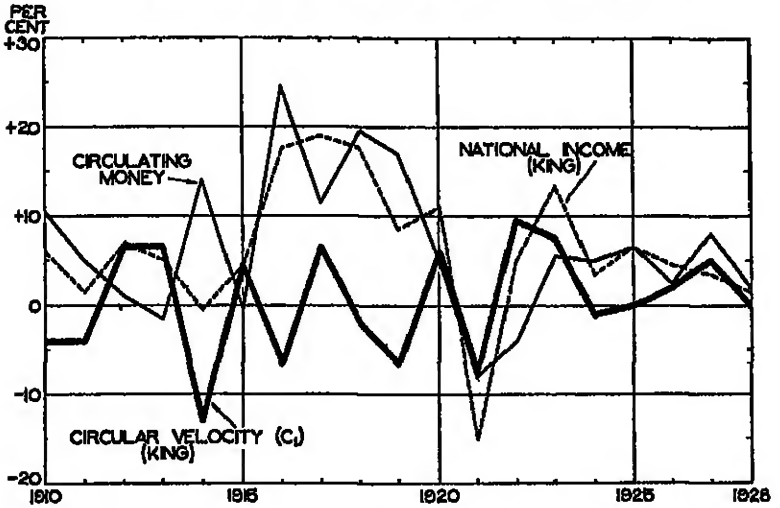
To repeat, then, the changes in the national income after 1909 were predominantly associated statistically with changes in the stock of circulating money rather than with changes in circular velocity in 1909–1928, though the association was less close for year-to-year fluctuations than for the general paths of movement of the two factors. There was also some tendency for changes in the money stock to lag behind changes in the national income, so far

[1] That is, in 53 per cent of the cases in 1909–1928, the year-to-year changes in the national money income and those in circular velocity were related inversely or indifferently.

[2] It should be pointed out that, since the general trends of the national income and the money stock are so similar, it is a priori probable that their year-to-year fluctuations should also be quite closely associated. The fact that, despite the complete dissimilarity in the trends of the national income and circular velocity, their year-to-year fluctuations are as closely associated as they are suggests that this association is distinctly more significant in comparison to that between the year-to-year fluctuations of national income and money stock than the above figures indicate. Elimination of the trends would substantially reduce the apparent closeness of the latter association, on a year-to-year basis. One's choice between these two points of view must be a matter of what one is aiming at.

as lags can be judged from annual data. It is evidently not possible to deduce from these facts either that the national income "determines" the size of the money stock or that the size of the money stock determines the size and fluctuations of the national income. It is hardly likely, however,

CHART XXIII.—YEAR-TO-YEAR PERCENTAGE CHANGES IN NATIONAL INCOME, IN MONEY STOCK AND IN CIRCULAR VELOCITY: 1909–1928



that so close an association between the two magnitudes over a period of twenty-odd years was merely accidental. In one way or another, they must certainly be "causally" related.[1] Both these conclusions and the palpable limitations upon them are of significance to monetary theory and to proposals for monetary reform.[2]

[1] An hypothesis of interaction is evidently plausible, with the money stock *not* the initiating factor in expansions. This leaves unexplained, of course, the source or sources of the initial expansion in the national income.

[2] It is tempting to infer from the data presented above that stabilizing the quantity of money (either holding it absolutely constant or allowing it to change gradually and evenly) would remove most of the larger fluctuations in the national income; see the suggestion ventured in Chap. II, Sec. V. Those fluctuations which remained would be the ones attributable to fluctuations in circular velocity, which from 1909 to 1929 were comparatively small. Whether such stability would have prevented the collapse after 1930, by preventing the development of the conditions

A corollary observation of some interest can be made by turning back to Chapter II, and particularly to Chart IX therein. A comparison of Charts IX and XXII indicates that the national money income moved fairly closely with the various broad measures of nonfinancial activity in the period (1919–1932) which is common to both charts, resembling their general average more closely than any one of them taken separately. It also resembled these measures more closely than did the stock of circulating money, of which the principal component, circulating deposits, is also shown on Chart IX. On the other hand, the general patterns of movement of both the national income and the money stock are quite unlike those of the indices of deposit-exchange velocity, examined in Chapter IV. The latter are concave upward on both sides of 1929, and their year-to-year fluctuations are quite different. This latter lack of close relationship is significant. It can be explained in part by the factors examined in the next section.

IV. THE RELATION OF CIRCULAR VELOCITY TO EXCHANGE VELOCITY, 1921–1932

In the present chapter, we have examined briefly the indirect evidence on the character and behavior of the "circular" velocity of money. Is there any definite logical relation between this circular velocity and the exchange velocity of bank deposits, discussed in the preceding chapter?

It seems reasonable to think that such a relation exists and that, subject to certain qualifications, the relation is likely to prove fairly stable in numerical terms. Circular velocity measures the number of times in a unit period that the average unit of money completes its generally circular movement from consumers to producers and back

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from which the collapse evolved, cannot be argued here. For an extension of this line of considerations, see my paper on Monetary Control and General Business Stabilization, in the "Economic Essays in Honour of Gustav Cassel" (1933).

to consumers. The unit of money effects this circular movement by being passed from one individual or firm to another. Evidently it must change hands at least twice every time it completes one circle. The consumers pay it over to the producers for finished goods received, and the producers subsequently pay it back to the consumers in the aggregate, for services purchased and the like. Actually, of course, the organization of production and exchange is more complicated than this. Retailers, wholesalers, and jobbers usually enter in, and the successive stages of the extraction and fabrication processes themselves are commonly divided between a number of different firms. The *average* unit of money presumably changes hands a number of times in passing around any one average consumer-producer-consumer circle.

Let the average number of times that the average unit of money changes hands in passing around this circle—which is also the *average* number of stages or levels into which the aggregate production and exchange process is divided—be designated by L. Let C be the average *circular* velocity of money, and let V be its average *exchange* velocity, or the number of times the average unit of money changes hands per unit period. We then have[1]

$$C \times L = V,$$

or

$$\frac{V}{C} = L.$$

This equation can be valid only with respect to those transactions to which C also relates. It is not valid with respect to the great majority of those financial transactions which were discussed in Sec. I above, and which were excluded from the equation there presented for the relation between national income, the money stock, and circular

[1] For a discussion of this equation see my article in the *Quarterly Journal of Economics*, November, 1933.

velocity.[1] The same exclusion was also made, as far as was possible, in the numerical data presented in Sec. II. In the statistics available on exchange velocity, however, it is not possible to make a numerical separation of these financial transactions from those of other types. Moreover, the exchange-velocity figures presented in the preceding chapter relate to bank deposits only, and for them, as previously remarked, are presumably substantially too high. Although the debits figures include perhaps 85 per cent of the universe, the deposit figures include only about two-thirds of it. Finally, there are no usable estimates at all on the volume of transactions conducted with currency, and hence none on the exchange velocity of currency.[2] Any attempt to make an examination of the existing data on the relation between circular and exchange velocity can therefore be only tentative.

Despite these difficulties, however, such an examination yields some rather striking if rough results. On the accompanying Chart XXIV are shown two sets of values for the ratio L. One is based on the indices of exchange velocity of circulating bank deposits for the country as a whole (141 cities), the other on those for the 140 cities outside New York City, as presented in the preceding chapter.

[1] Evidently the total money volume of *all* transactions T is simply $M \times V$. Now let those financial transactions which it is desired to exclude (but new saving and investment are *not* excluded) be F. Then from the above equation (compare the equation in Sec. I above)

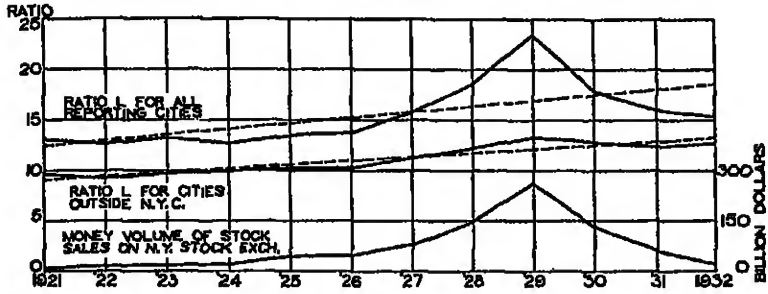
$$M \times C \times L = T - F.$$

As suggested in Sec. I, this expression probably ordinarily embraces 85 to 90 per cent of all transactions involving the use of actual currency or deposits.

[2] This latter gap in the data is considerable, but it is probably not so serious for the present purpose as might be thought. For the period from 1921 to the beginning of serious currency hoarding in 1931, the ratio of outside currency to circulating deposits averaged about 20 per cent and was in general declining, as shown on Chart III above. If we suppose that the average unit of outside currency changes hands every two weeks, its average exchange velocity is 26 per year; if every three weeks, as seems rather more plausible for the country as a whole, only 17 per year. On the latter basis, the inclusion of outside currency velocity would lower the average value of the ratio L, as based on outside cities, only 8 per cent (see the following chart).

Both exchange-velocity indices are expressed as annual averages, and are then divided by the figures given earlier in the present chapter for the circular velocity of circulating money.[1] The resulting L ratios are too high in absolute terms both because of the omission of currency transactions and—what is much more important—because the exchange-velocity indices for deposits are too large, as already explained. The general direction of the trends and the larger

CHART XXIV.—EXCHANGE VELOCITY INDICES DIVIDED BY CIRCULAR VELOCITY (RATIO L), AND THE MONEY VOLUME OF NEW YORK STOCK SALES, ANNUALLY: 1921–1932



fluctuations, however, are believed to have substantial significance.

The most important fact shown by the chart is that the trends of both L curves appear to be definitely upward, despite the severity of the expansion and contraction of 1929–1930. This is conspicuously true of the curve based on cities outside New York City; the curve was as high in 1931 and 1932 as it had been in 1928. The curve for all reporting cities includes New York City, which is of course a large fraction of the total. This curve fluctuates much more widely than the other.

It seems plausible to associate the marked 1929 peak in both curves with the tremendous expansion and subsequent

[1] For this purpose it seems permissible to neglect the actual discontinuity of the circular velocity series at 1928–1929. On this discontinuity, see Sec. II above.

For reasons previously indicated, the circular velocity of circulating money seems rather more significant here than that of total money; see footnote on p. 145.

collapse of the volume of security transactions in 1927–1931. This suggestion is supported by the movements of the bottom curve on the chart, which gives a rough estimate of the annual money volume of stock sales on the New York Stock Exchange. The stock sales curve is more closely associated in 1927–1931 with the *L* curve for the country as a whole (which presumably reflects New York in disproportionate degree, because of the large fraction New York debits make of debits for the country as a whole), than with that for the outside cities. But it also has some relation to the latter curve. This gives further evidence, if any is needed, that the whole country participated in the increase in security transactions during the period. It is also worth noting that the association of stock sales with the *L* curve for outside cities does not become marked until these sales reach a certain (or uncertain!) level, of around 75 billions a year as here estimated, and apparently wanes when they drop below that level. Its association with the 141-cities curve, which includes New York City, is more protracted.

None of this analysis, of course, is conclusive, for it is drawn from material that necessarily suffers from large errors and omissions. It clearly suggests two inferences, however, which may be stated briefly. First, either the complexity of organization of the productive and distributive processes as a whole was persistently increasing through 1929, or—what seems less likely—the tendency toward vertical and horizontal integration of business enterprises prevailing before 1921 was being replaced by a movement toward increasing subdivision of the production and exchange processes between formally independent concerns. The first of the two explanations outlined seems consistent with the general history of business enterprise since the war.[1]

[1] But the rising trend of the *L* curves does not give any indication as to whether the "structure of production" was becoming more "capitalistic" in the Austrian sense. Also note that the rise is not accounted for by the shifts in the size of the deposits sample used in determining exchange velocity; see footnote on p. 98.

Whichever explanation may be correct, in 1921–1929 given units of money were changing hands a larger and larger number of times, on the average, as they passed through the consumer-producer-consumer circle. This latter inference is suggested especially by the apparent trend of the L curve for outside cities.

Second, the financial class of transactions seems to have been chiefly responsible for the 1929 peak in both L curves, for nothing else was going on which would have been likely to produce peaks of that precise character at that precise time. So far as financial transactions were responsible for the 1929 peak in the ratio L, this peak must be viewed as essentially spurious for our present purposes. To the extent that it is thus explained, it reflects an increase in the exchange velocity of bank deposits which was *not* associated with any increase in the volume of those payments, arising out of the production and exchange of goods and services, to which the concept of the *circular* velocity of money can alone relate. With better data, we should probably be able to exclude the financial class of transactions almost entirely in computing deposit-exchange velocity. Presumably much of the 1927–1930 peaks in the L curves would then disappear, while at the same time the trends would become more clearly defined.[1]

V. SUMMARY

The findings of this chapter can be summarized as follows:

1. The estimated circular velocity of circulating money showed a remarkably high degree of stability, on the whole, from 1909 to 1930. In this period its trend was nearly horizontal, and the fluctuations around the trend were not wide

[1] It also follows that, so far as financial transactions are negligibly small or can be roughly eliminated statistically, C_1 can be interpolated from V within the annual values given above, after allowance for the apparent current trend of L, and can even be extrapolated forward for a time beyond the last available national income estimates.

as compared with those of most economic time series. Relative to the trend, circular velocity varied roughly with business activity. These facts suggest that the general numerical size of circular velocity and the character of its trend are to be explained primarily in terms of the general monetary and payment habits of the country, which presumably change slowly, whereas its year-to-year changes are to be explained chiefly in terms of inverse fluctuations in what we have called "idle" balances. The great drop in circular velocity after 1930 is probably accounted for, in largest degree, by the currency and deposit hoarding of the period (which itself involved an accumulation of "idle" balances), rather than by any large change in the country's monetary or payment habits.

2. The general path of movement of the national money income was very closely associated with that of the stock of circulating money in 1909–1928 and very slightly associated with that of circular velocity. The year-to-year associations (unadjusted for trends) were more evenly divided, but with that between national income and money stock still predominant. From 1929 to 1932, however, the association of national income with circular velocity was somewhat closer than its association with the money stock. Through the whole period 1919–1932, the national income moved with the broad nonfinancial measures of economic activity presented in Chapter II rather more closely than did the money stock itself.

3. The ratio between exchange velocity and circular velocity, so far as the available data permit it to be examined, shows a persistent rise through 1929 on both bases of measurement. This we have interpreted as probably reflecting a tendency toward increasing complexity in business organization and the payment machinery. The 1929 peak in the ratio is apparently associated primarily with the abnormal volume of financial transactions of the period,

which caused the exchange velocity of bank deposits to rise out of all proportion to any detectable increase in the volume of transactions in goods and services. To this extent, the 1929 peak in the ratio was spurious for purposes of comparison with circular velocity. The fact that the ratio based on the 140 outside cities did not fall materially after 1929 is also striking; it suggests that, despite the severe decline in economic activity in 1930–1932, the general patterns of business organization and of payment methods prevailing in the previous years were fairly well maintained.

4. A comparison of the data examined in the present chapter and in Chapter II also lends some support to the inference that the quantity of money actually tied up in the financial class of transactions is comparatively small. This rather small quantity of money, however, is apparently capable of acquiring a very high exchange velocity, as during the period of security speculation culminating in 1929, and it is hence capable of carrying a relatively large money volume of transactions. The latter conclusions seem to hold good even after allowance for devices such as stock clearing, which eliminates much the largest part of the exchanges of actual deposits or currency otherwise necessary.

Chapter VI

A REVIEW AND SOME INFERENCES

THE preceding studies have presented a number of facts and relations concerning the supply of money in the United States. It is hoped that these facts and relations will be helpful both to practical bankers and to monetary economists.

To a considerable degree, the studies have undertaken to break new ground. For whatever reason, to date there has been rather little effort to obtain objective answers to questions of the types posed in the foregoing pages. Practical bankers and most monetary economists have alike been content, in formulating their general interpretations of current happenings and their conclusions on matters of appropriate future policy, to rely in large degree on deductions from current rules of thumb, from the dictates of "common sense," or even from general premises that at bottom are purely conjectural. In contrast to such methods of procedure, the investigations whose results are described above represent some first steps in an endeavor to discover what the actual "facts" are or have been, so far as the data utilized permit, and to develop generalizations, derived from the systematic examination of these facts, which can be used with confidence as the foundations for practical policies and for theoretical analysis. The present studies, which have been limited both by the data and by the time and resources currently available, cannot claim to have achieved these objectives completely in any one of the fields examined. They have been essentially exploratory in character, as was stated at the outset, and they have not been tightly knit around any one narrowly defined problem. They

have all aimed, however, at an objective examination of various aspects of the behavior of money, viewed both by itself and in its relation to the economic life of the country at large. Within this general area of investigation, it is believed that the studies reach results of value.

The first major problem set up for examination, one selected as a starting point chiefly because it seemed to lend itself rather readily to statistical attack, was the problem of the relation between the quantity of currency in circulation and the quantity of bank deposits. Even the most superficial inspection shows that this relation, contrary to a fairly common assumption of monetary theorists, is stable neither in short periods nor over time. Barring certain extreme movements, which can be accounted for in terms of extraordinary contemporary events, the currency-deposit ratio has manifested a fairly persistent decline since 1890, the beginning of the period here examined. But even this decline is not sufficiently uniform, in rate or even in consistency of appearance, to afford a very firm basis for action or interpretation to individual bankers, to monetary theorists, or to the central authorities charged with monetary and banking control.

On investigation, it became clear that the instability of the currency-deposit ratio was due to the fact that its two components, currency and deposits, are themselves proximately "governed" by, or at least are statistically most closely related to, quite different sets of factors. Outside currency in circulation is predominantly related to the receipts and expenditures of individual consumers; deposits are related to the volume of production, wholesale activity, and even (at times) financial transactions. These two underlying groups of factors in turn are not closely related to one another in their shorter-period fluctuations. In addition, they have shifted in relative importance with the passage of time. The movements of the currency-deposit

ratio, which in a loose sense is the resultant of these factors, have therefore necessarily followed a somewhat complex and variable pattern.

These preliminary results encouraged a more detailed though still rather tentative exploration of the factors that appear to be most closely related to the quantity of money and to the intensiveness with which it is used, that is, to its exchange velocity. A recapitulation of all the positive and negative conclusions suggested by this exploration is not necessary. The broad relations, which seemed to be either quite clearly established or at least strongly indicated, are as follows: First, both the quantity and the exchange velocity of circulating deposits for the country as a whole move *with or after*—not before—the rough aggregate of the general measures of volume of production and wholesale activity, but not with any one of these measures taken separately, or with commodity prices. Exchange velocity for the country as a whole also moves with the volume of financial transactions when these become very large. Second, what is a plausible corollary, the proportion of the national total of circulating deposits which each region holds is broadly related to the comparative "volume of business" which that region carries on. Third, at least in the case of the New York reserve district, this latter proportion was also related very intimately to the movements of gold on *domestic* account into and out of the district; but it was usually *not* closely related to gold movements on foreign account, partly because of the effect of offsetting open-market operations and partly for other reasons. Fourth, the country as a whole is neither characteristically homogeneous nor characteristically heterogeneous in its reactions to broad banking movements. Rather, the data show a lack of "uniformity" in either respect. Fifth, none of the monetary and banking series examined revealed, for the relatively short period available, anything which was regarded as constituting a

genuine "cyclical" pattern in any useful sense of the latter term; but this conclusion rests on admittedly insufficient evidence and methods, and perhaps on too narrow a definition of the term "cycle." Sixth, the exchange velocity of circulating deposits in New York City taken by itself is proximately related much more closely to measures of the volume of financial transactions alone than to nonfinancial measures. Seventh, for the country at large as well as for New York City, and for the quantity of circulating deposits as well as for their exchange velocity, the importance and apparent influence of the volume of these latter financial transactions have been greater in the period examined, it seems fair to say, than is usually recognized.

Of these broad facts and relations, so far as they are valid, the first and the last have perhaps the most general significance. They bear with especial force on certain recent proposals for monetary action and control. First, they do not lead one to have great confidence that deliberately induced *changes* in the quantity of bank deposits or of currency will produce desirable and reasonably prompt effects upon the general volume of economic activity. For example, the data examined in Chapter II do not "prove," of course, that a deliberately induced substantial contraction of deposits will fail to force a contraction in business activity which would not otherwise have taken place. But since deposits ordinarily move with or after business activity, not before, and hence are ordinarily a passive rather than an active factor at the start of the larger changes, and since they do not move at all closely with commodity prices, it is a little difficult to see how and why a moderate contraction of deposits should necessarily reduce business activity in marked degree and fairly quickly.[1]

[1] It seems more likely that a forced deposit contraction of "moderate" size (say 1 or 2 per cent, which is rather more than the range of the Federal Reserve system's open-market operations before 1932) would be made good out of the "idle" balances referred to in Chap. V. Some increase in interest rates might be

On the other hand, a sharper contraction, of say 20 per cent or more, would be likely to force a business depression so severe as to be worse than the original disease. Similar conclusions apply with respect to the probable effects of the opposite action, forcing a deliberate *expansion* of the quantity of money. This last, of course, is the problem of chief importance in this country at present. There is little in the data we have examined to support the belief that deliberately enforced increases in the quantity of money will produce a sound and lasting economic recovery. As just remarked, the largest part of the money supply moves with or after business activity, not before it. A "moderate" enforced expansion of the money supply therefore seems likely to have little effect on current business activity, and may be absorbed chiefly in the "idle" balances discussed in Chapter V. A large and continued expansion, on the other hand, will undoubtedly raise prices, but also seems extremely likely to bring on such a contraction of the real volume of economic activity, ending in virtual collapse, as took place in many of the European countries after the war. These considerations bear forcefully on the political and other proposals now current, which insist that "reflation," "inflation," or some similar method offers a sure and quick weapon for forcing a sound economic recovery. An examination of the recorded facts, both for the period since 1930 and for earlier years, does not lead one to place great confidence in these proposals.

Second, the relation between the total quantity of money and the level of commodity prices has not been explored carefully in the present studies. But the palpable lack

involved, but a superficial inspection of the data on this question does not indicate that a moderate increase in such rates (again say 1 or 2 per cent) is likely to produce any very immediately perceptible effect on business activity. An increase of this size, appearing in the central money markets, may add little or nothing to the rates paid by bank customers. See J. W. Angell and K. F. Ficek, The Expansion of Bank Credit (*Journal of Political Economy*, February and April, 1933).

of any high degree of intimacy in this relation must raise doubts as to the efficacy of those plans which propose to "stabilize" prices through changing the supply of money. The fact that commodity prices, both wholesale and retail, appear to be much more closely associated in their general paths of movement with outside currency than with the far larger volume of circulating deposits offers a particularly knotty problem to such plans. Similar considerations weigh heavily against the prospects for success of the current political proposals to force up commodity prices and thus (it is alleged) induce a sound general economic recovery, through a "moderate" enforced inflation of currency or deposits or both; this has been alluded to already.

Third, efforts to base deposit-control policies and actions partly or wholly on the fluctuations of exchange velocity are also likely to be rather seriously misdirected at times, because of the substantial influence exercised over exchange velocity (even outside of New York City) at crucial periods by the volume of financial transactions alone. The movements of financial transactions are not always closely related to the movements of general production and exchange, and control measures that are materially affected by their volume will not assuredly stabilize these latter and more important types of economic activity as well. The considerations involved here were elaborated at the end of Chapter IV.

To put the whole matter briefly, if rather loosely, serious difficulties stand in the way of achieving desirable general economic objectives by enforcing artificial and presumably fairly frequent *fluctuations* in the quantity of money, no matter what criterion is used to guide this manipulation. The heart of these difficulties lies in the fact that the relation of the quantity of deposits to general economic activity is apparently not sufficiently close or uniform to make it seem probable, especially with regard to short periods, that such

enforced fluctuations in deposits will be accompanied by parallel fluctuations of desirable sorts in the leading categories of general activity. It should also be stressed, however, that nothing in the data examined above appears to be inconsistent with the view, suggested at one or two earlier points, that enforcing substantial *stability* in the quantity of deposits would yield desirable results.

The last major problem investigated was that of the relation of the *circular* velocity of money to certain other factors. The necessity of using annual data here prevented any great precision in the results. It was found, first, that the circular velocity of money fluctuated from year to year roughly with business activity in 1909–1932, but that its trend was nearly horizontal. In view of the wide absolute changes in nearly all other economic measures during the period examined, the inference seemed clear that the general size of circular velocity is determined chiefly by payment habits and the relative size of "idle" balances. The volume of money payments, the current degree of general economic activity, and the like influence only its shorter-period fluctuations. Second, the ratio between exchange velocity and circular velocity shows a rising movement through 1929, and the ratio based on the 140 outside cities shows relatively little decline thereafter. This was taken as evidence of persistently increasing complexity in the organization of payment transfers through 1929, and therefore in the organization of production and exchange at large, at least with respect to the handling of money payments. Third, even from year to year the fluctuations of the national money income in 1909–1928 were more intimately associated with those of the stock of circulating money than with those of circular velocity (measured without elimination of trends), while over time the general paths of the national income and of the money stock showed at most points a very high degree of similarity.

These latter findings too have an important bearing both on the analytic aspects of monetary theory, and on monetary policy. With respect to the latter, it again seems a plausible inference that, if the ultimate objective of policy is to induce a greater degree of stability in national and individual money incomes—an objective which is defensible and which has been accepted by many—then the most effective procedure is to stabilize the quantity of money itself. This quantity would not be held absolutely constant, perhaps, but it would be allowed to change only gradually and evenly. Marked fluctuations in economic activity and in the national income would doubtless still remain, but there is ground for thinking that they would be far less severe and injurious than those from which we now suffer. This view has been adumbrated at earlier points.[1] It will not be considered at greater length here, however, since it involves a type of discussion which lies outside the province of the present volume.

Such are the principal broad conclusions as to facts which were reached in the several preceding exploratory studies, and such are the principal inferences that were drawn in each of them. In addition, two further inferences that can be derived from the studies as a whole may be pointed out.

One concerns the relation of these studies to general monetary theory. The data examined do not go far enough, of course, to provide even a partial confirmation or refutation of the major types of monetary doctrine now current,

[1] See earlier in the present section; also Chap. II, Sec. V (paragraph 6), and footnote on p. 147. It seems likely that, to make such stabilization practicable, certain changes in the character and operation of our present monetary and banking system would be required. At present every new act of lending or of investment purchase by banks, except in dealings with other banks, increases the effective quantity of "money" in the country while every loan repayment or sale of assets, except in dealings with other banks, decreases it. Since detailed control of every banking operation would be very difficult to achieve for practical reasons, stabilization of the total quantity of money is now almost impossible. These highly undesirable conditions can be changed, however; for an outline of one possible scheme, see the suggestions at the end of my article, The 100 Per Cent Reserve Plan (*Quarterly Journal of Economics*, November, 1935).

except with respect to certain proposals for control, and they were not collected primarily with that purpose in view. The data give some indication, however, that a rather different general orientation of monetary theory from that now in vogue may prove to be useful, and even a rather different formulation of the problems in issue. The preceding studies do not offer such an alternative formulation. But they do suggest that, if monetary theorists had started out by making intensive systematic examinations of the accessible statistical and other objective factual material, and had attempted to phrase their doctrines as far as possible in terms of this material, the present content of the doctrines might have been substantially altered.

Consider, for example, the predominant emphasis that many writers now place on interest rates and their relation to capital formation. At the present day, no one would deny the great importance of these factors. But they are surely not the only factors of significance, and they are probably not the exclusively controlling factors. The data examined above make it clear, at least to my mind, that any general monetary theory which places its chief stress on "the" interest rate and on the effects of changes therein is likely to be seriously defective, because it is likely to disregard large areas of known and significant objective phenomena.[1] "The" interest rate can at most lay claim to comparable—not to greater—importance in general monetary theory with such factors as the national money income, the current volume of new saving and investment (which do *not* appear to respond very closely to changes in interest rates), the

[1] There is no such thing as "the" interest rate; there is a structure of many different rates, which are not very tightly bound to one another. A cursory examination of the limited available data also suggests that there is no close relation between "the" interest rate, in any statistically usable sense of the term, and the current volume of certain large classes of saving and investment; for example, such as are involved in the plowing back of business earnings, and even in the issue of new equity securities.

quantity and velocity of the money stock, and the price and quantity of the current output of goods and services. It would almost certainly be impossible to demonstrate objectively, in reply to this proposition, that the important changes in these latter factors can be explained wholly or chiefly in terms of changes in the interest-rate complex. Complaint can also fairly be made that monetary theorists have put so much time into evolving and debating theories which, from their very nature, cannot be anchored with firmness on objective facts obtained from systematic observation, that the collection and examination of such facts has suffered seriously.

The second inference arises out of the fact that the studies do not provide conclusive evidence of the existence of a clearly defined and closely knit system of monetary and general economic relations, with clearly defined and reasonably uniform sequences or orders of change. The present investigations have been fragmentary, of course, and have made no pretense at covering any part of the total field thoroughly. But one might have expected that, if a definite system of relations had existed, it would have manifested itself unmistakably even in the incomplete data here examined.

The failure to find such conclusive evidence can be taken, if one pleases, as an indication that monetary phenomena are fundamentally irrational and chaotic. So gloomy a view is probably unnecessary. The more defensible inference is presumably that a rational system or series of systems of relations does exist and that, given adequate data, it could be detected by the appropriate analytic procedures. There are at least three grounds on which the failure of the present studies to achieve this result can then be explained. First, the methods used at most points have been comparatively loose and inaccurate, as was indeed made necessary by the character of the raw materials available. Second, we have been dealing almost entirely with broad mass phenomena,

relating to the country as a whole or to large geographic areas. We have therefore also been dealing with broad summations or averages, which may well have concealed the often diverse and conflicting movements of their many separate components. Fairly tight causal sequences may actually exist, and yet have been blurred over by these large summations and averages. Third, monetary phenomena—and the same thing is of course true of economic activity in general—are not constrained to run always in uniform and endlessly recurrent patterns. At each important point a number of alternatives are likely to present themselves, and there is no guarantee that the actual course of events will show the same selection between the alternatives each time. If this latter view makes the task of orderly analysis seem complex and the problem of control difficult, at least it can plausibly claim a greater realism than simpler and more rigid interpretations of the nature of the problem.

Appendices

Appendix A

MISCELLANEOUS COMPARISONS

A NUMBER of further comparisons are given on the following charts. Some of them have been referred to at earlier points. Others are given because they offer convenient compilations of facts not, in the main, easily accessible elsewhere in summary form. No extended analysis or interpretation will be made.

CHART XXV.—THE RATIO OF CIRCULATING DEPOSITS TO TOTAL DEPOSITS, ALL BANKS, ANNUALLY: 1890–1934

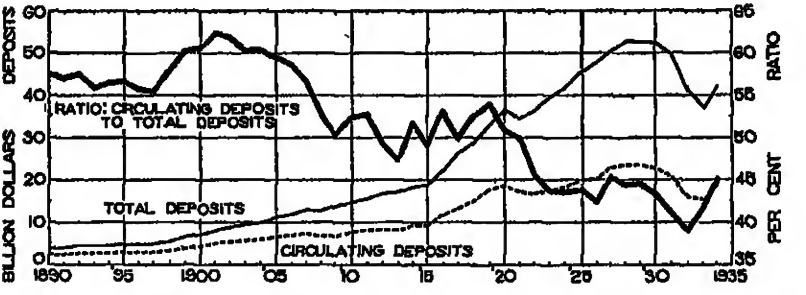


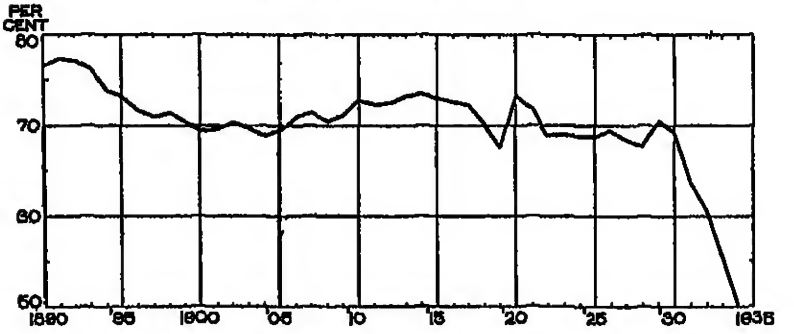
Chart XXV shows the ratio of circulating deposits alone (deposits subject to check, less duplicating items) to total deposits, on the June call dates since 1890. Before 1909 the data required to make this division of deposits entail a good deal of estimation, as pointed out in Chapter II, but thereafter they are believed to be more accurate.[1] This ratio shows a gradually declining trend since the turn of the century. To about 1897, estimated circulating deposits were slightly greater than the sum of estimated time and savings deposits, and in the next few years the proportion actually rose somewhat. From 1899 through 1905, circulating deposits were roughly 60 per cent of all deposits. But from 1909 through 1921 circulating deposits were hardly more than half of the total (they rose relatively during the war),

[1] The basic data are given in Table I of Appendix B.

and from 1922 to 1932 they constituted a steadily declining fraction. By 1932, they were less than 40 per cent of the total. The chart thus offers an interesting picture of the changes in the country's deposit-using habits over the last forty-five years, and one not without significance.

Chart XXVI gives a ratio from the asset side of the balance sheet, again on the June call dates since 1890. This is the ratio of total loans to combined loans and investments.[1] The ratio shows, on the whole, remarkable stability from 1897 to 1930, at a level of about 70 per cent. It appears to have fluctuated roughly with and after business activity,

CHART XXVI.—THE RATIO OF TOTAL LOANS TO LOANS AND INVESTMENTS, ALL BANKS, ANNUALLY: 1890–1934



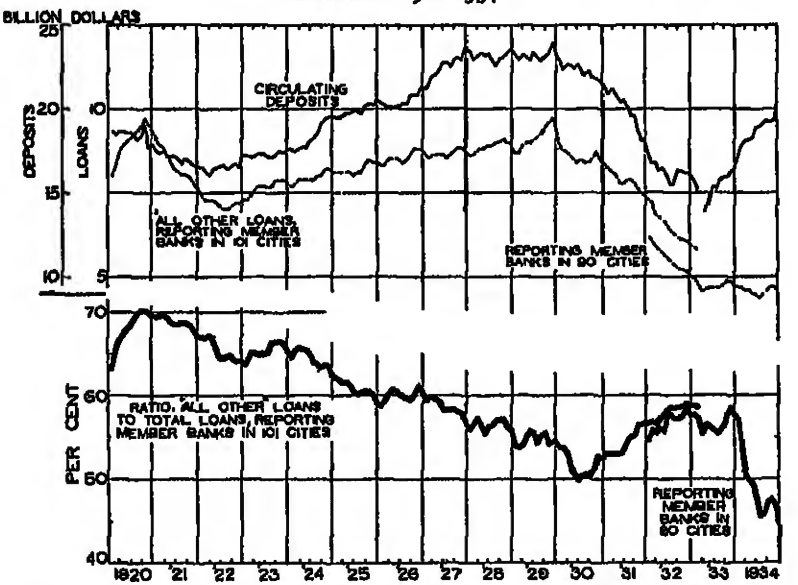
but, apart from the period after 1930, it fluctuated much more narrowly than might have been expected. The ratio, however, is probably somewhat misleading. The category of "loans" contains, of course, collateral loans on securities and real estate, and presumably does not reflect at all closely truly commercial and industrial activity.

This latter inference is supported by Chart XXVII, which gives the ratio of "all other" loans (bottom curve) to total loans, monthly since the end of 1919 for Federal Reserve member banks; "all other loans" is a more accurate measure of purely commercial and industrial lending (data defective before 1919). This ratio declined steadily from 1920 to 1930, though with a tendency to rise above its trend somewhat *after* marked increases in business activity. As the relative importance of direct bank loans and dis-

[1] Data from the Annual Reports of the Comptroller of the Currency.

counts to industry and commerce declined, that of loans on securities and real estate evidently increased, leaving the proportion of total loans to aggregate earning assets substantially unchanged (see Chart XXV). The relative movements of the two upper curves are also striking (note the difference in scales).[1] "All other" loans rose less sharply

CHART XXVII.—"ALL OTHER" LOANS, TOTAL LOANS AND CIRCULATING DEPOSITS, MONTHLY: 1920–1934



than circulating deposits in 1922–1929, but fell relatively much farther in 1929–1932, and failed to rise materially thereafter. At most points they seem to move with or after circulating deposits, but not before, and they are much less variable.

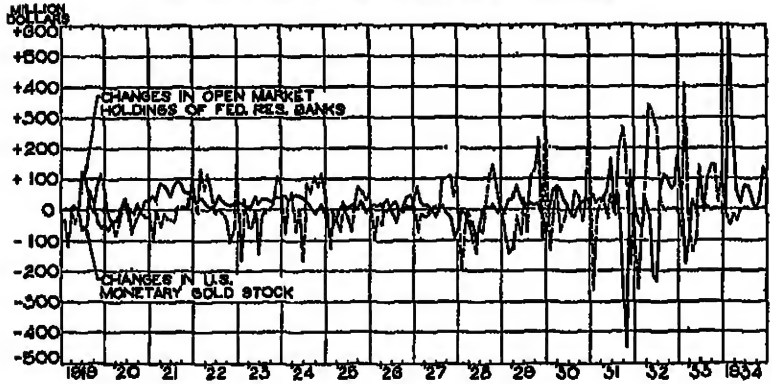
Finally, Chart XXVIII gives two curves dealing with a different set of problems. One curve shows the changes in the monetary gold stock of the United States at the old par, that is, apart from the proceeds of the 1934 revaluation. The second curve gives the changes in the open-market holdings of the Federal Reserve Banks (United States

[1] Circulating deposits from Table I of Appendix B; other data from the Annual Reports of the Federal Reserve Board.

securities held, plus bills bought) for the country as a whole. Both are monthly from 1919 to 1934.[1]

These curves should be compared with those on Chart XIII in Chapter III. It is evident that at a number of points the Federal Reserve system's open-market operations did smooth over the shorter fluctuations in gold imports and exports (which were the chief source of the short-period

CHART XXVIII.—MONTH-TO-MONTH CHANGES IN THE MONETARY GOLD STOCK AND IN OPEN MARKET OPERATIONS: 1919–1934



fluctuations in the aggregate monetary gold stock); but that at others they did not, and that, in consequence, large and sometimes rather sharp variations did occur in the size of this part of the aggregate credit base.[2] The effect of the open-market operations undertaken in recent years, in the hope of checking the depression and starting business recovery, is also clear. A comparison with the deposits curves in these years offers a striking commentary on the short-run ineffectiveness of this device under the circumstances then prevailing.

[1] Data from the *Federal Reserve Bulletin* and the Annual Reports of the Federal Reserve Board.

[2] Some allowance should doubtless also be made for the gold which was effectively "frozen" through the issue of gold certificates rather than Federal Reserve notes at various times in the 1920's; and in more recent years for the tying up of gold behind Federal Reserve notes themselves, in excess of reserve requirements, because of the deficiency of eligible paper.

Appendix B

TABLES

Appendix B

TABLE I

THE SUPPLY OF MONEY, VAULT CASH, AND CERTAIN RATIOS, ANNUALLY ON JUNE CALL DATES: 1890–1934
(In Millions of Dollars)

On or about June 30	Outside Currency	Vault Cash	Total Deposits	Circulating Deposits	Ratio *h* (1 ÷ 3)	Ratio *H* (1 ÷ 4)	Ratio of Vault Cash to Outside Currency (2 ÷ 1)	Total Money (1 + 3)	Circulating Money (1 + 4)
	1	2	3	4	5	6	7	8	9
1890	941	488	3,993	2,295[1]	0.236	0.410	0.519	4,934	3,236
1891	1,000	498	4,126	2,351[1]	0 242	0 425	0 498	5,126	3,351
1892	1,016	586	4,572	2,629[1]	0 222	0 386	0.576	5,588	3,645
1893	1,081	516	4,516	2,524[1]	0.239	0.428	0.477	5,597	3,605
1894	972	689	4,587	2,592[1]	0 212	0 375	0 709	5,559	3,564
1895	971	631	4,838	2,744[1]	0 201	0 354	0 650	5,809	3,715
1896	974	532	4,841	2,703[1]	0 201	0 360	0.546	5,815	3,677
1897	1,013	628	4,979	2,763[1]	0 203	0 367	0 620	5,992	3,776
1898	1,150	688	5,615	3,351[1]	0 205	0 354	0 598	6,765	4,501
1899	1,181	723	6,545	3,941[1]	0 180	0.299	0.612	7,726	5,122
1900	1,305	750	7,104	4,304[1]	0 184	0 303	0 575	8,409	5,609
1901	1,368	808	8,097	5,054[1]	0.169	0 271	0 590	9,465	6,422
1902	1,401	848	8,910	5,491[1]	0 157	0 255	0.605	10,311	6,892
1903	1,510	857	9,416	5,687[1]	0 160	0.266	0.568	10,926	7,197
1904	1,529	991	9,880	5,963[1]	0.155	0.256	0 648	11,409	7,492
1905	1,594	904	11,126	6,634[1]	0.143	0.240	0 624	12,720	8,228
1906	1,720	1,016	11,862	6,953[1]	0 145	0.247	0 591	13,582	8,673
1907	1,659	1,114	12,870	7,390[1]	0.129	0 228	0 672	14,529	8,949
1908	1,670	1,368	12,565	6,652[1]	0 133	0.251	0.820	14,235	8,322
1909	1,644	1,452	13,669	6,886	0.120	0.239	0 884	15,313	8,530
1910	1,678	1,424	14,710	7,707	0 114	0.218	0.849	16,388	9,385
1911	1,660	1,554	15,547	8,192	0.107	0 203	0 936	17,207	9,852
1912	1,712	1,573	16,683	8,204	0.103	0.209	0 919	18,330	9,916
1913	1,703	1,561	17,133	8,089	0.099	0.211	0.917	18,836	9,792
1914	1,820	1,619	18,108	9,356	0.101	0 195	0 901	19,928	11,176
1915	1,862	1,458	18,875	9,365	0.099	0.201	0 783	20,738	11,127
1916	2,163	1,486	22,230	11,784	0.097	0.184	0.687	24,393	13,947
1917	2,564	1,502	26,106	13,021	0.098	0.197	0.588	28,670	15,585
1918	3,585	897	28,606	15,050	0.125	0 238	0 250	32,190	18,635
1919	3,879	997	32,700	17,697	0.118	0.219	0.257	36,669	21,576
1920	4,191	1,076	36,657	18,656	0.112	0.225	0.245	41,047	23,047
1921	3,964	947	34,628	17,270	0 114	0 229	0.239	38,592	21,234
1922	3,633	830	36,388	16,507	0.100	0 220	0 228	40,021	20,140
1923	4,026	797	39,551	17,311	0.102	0.232	0.198	43,577	21,337
1924	3,938	912	41,864	18,174	0 094	0.217	0.232	45,802	22,112
1925	3,864	951	45,486	19,934	0 083	0.194	0.246	49,350	23,798
1926	3,890	998	47,719	20,178	0 082	0 193	0.256	51,608	24,068
1927	3,843	1,008	50,305	22,861	0.076	0.168	0.262	54,148	26,704
1928	3,909	888	52,639	23,356	0.074	0.167	0.227	56,548	27,265
1929	3,926	820	52,549	23,408	0 075	0.168	0.209	56,475	27,334
1930	3,656	866	52,325	22,661	0 070	0 161	0.237	55,981	26,317
1931	3,938	884	49,996	20,506	0.079	0.192	0 224	53,934	24,444
1932	4,904	792	41,249	16,124	0.119	0.304	0.162	46,153	21,028
1933	5,048	676	37,138[2]	16,484[2]	0.136	0.306	0 134	42,186	20,532[2]
1934	4,660	714	42,011[2]	18,903[2]	0.111	0.247	0 153	46,671	23,563[2]

[1] Estimate of Professor W. C. Mitchell, for individual deposits subject to check plus United States deposits. See his "Business Cycles" (1913), p. 531.
[2] Excluding deposits deferred by agreement with depositors.

The composition of the principal items in Table I is as follows. All original data are from the Annual Reports of the Comptroller of the Currency.

1. Outside currency is the residuals remaining after deducting, from total currency issued and not yet redeemed, the sum of the following: currency held in the Federal Treasury as part of its assets, currency in Federal Reserve Banks, currency with Federal Reserve Agents, and currency in the vaults of all banks in the United States, Alaska, and the island possessions. The last-named category we describe briefly as "vault cash."

These residuals are too large, though by a diminishing amount, because the vault cash of nonreporting banks is included in them. They are also too large because they include currency lost, burned, or taken abroad. These errors are not numerically very big, however, and may be mutually offsetting in trends (though not in absolute amounts). Data prior to 1890 were not utilized, though reported by the Comptroller of the Currency, because of the great importance of nonreporting banks in the earlier period. 1887 was the first year in which the Comptroller received reports directly from the state banks. Before that, he had simply added to his own data on National Banks the data on state banks in those states that required regular reports from state-chartered institutions; hence no private banks and few state-chartered banks had been included. With 1887, the Comptroller began to circularize the state banks directly, and thus received reports from some banks in each major category. Because of the unreliability of the data in the first few years, it was decided to carry the above table back only to 1890.

2. Vault cash is currency held in the vaults of all reporting banks other than Federal Reserve Banks.

3. The figures for total deposits are based on all reported deposits for all banks reporting to the Comptroller, with float deducted. Hence they include all deposits of individuals, private corporations other than banks, and government bodies (including United States deposits in Federal Reserve Banks); certified and cashiers' checks; deposits in postal savings banks and school banks; and cash letters of credit and travelers' checks outstanding (on this last group, see below). The float which is deducted includes exchanges for the clearinghouse and checks and other cash items on other banks, both local and out of town. This float is deducted because most banks credit checks and other cash-collection items as soon as they are presented for deposit, whereas the banks on which they are drawn do not debit their depositors until the checks or other items are presented for collection. Failure to deduct the float would therefore mean that certain deposits were counted twice. All reported interbank deposits are excluded. These consist of the reported "due to banks" item, time deposits of other banks, and deposits of postal savings banks in other banks.

Before 1926, cash letters of credit and travelers' checks outstanding were lumped with "all other liabilities" and were lost. Consistency requires that an effort be made to eliminate them from the deposits estimates. In 1926–1928, they were reported separately and amounted to 91.6 per cent of the sum of these items plus certified and cashiers' checks and unpaid dividends. Hence in 1926–1928 cash letters of credit and travelers' checks outstanding were eliminated directly; in 1929–1934, 91.6 per cent of the sum of these items plus certified and cashiers' checks and unpaid dividends (this sum being reported as an undivided total) was eliminated.

"Deposits not classified" were assumed to be distributed actually, as between the various categories of individual deposits, in the same proportions as are classified

individual deposits in each class of bank (National, state, stock savings, mutual savings, and private banks, and loan and trust companies). These proportions vary with the class of bank in question, and also vary over time. A rather long computation was therefore involved here. The same principles were also applied with respect to certain types of deposits which are included in the reports with classified individual deposits, but which we eliminated in estimating total deposits (notably deposits of postal savings banks in other banks and unpaid dividends). Hence not all unclassified deposits appear in our "total" deposits.

A problem also arises over the computation of United States deposits in all banks. (United States deposits in Federal Reserve Banks are also included here, because the United States Government draws checks directly on these deposits in making some of its own payments.) The problem lies in the fact that United States deposits in *all* reporting banks, as given in the published statistics, are smaller than United States deposits in Federal Reserve member banks taken alone, during the years 1917–1930. The larger figure here was therefore used, on the assumption that the reports of the member banks are more accurate than those of all banks. After 1930, the United States deposit figure for all banks becomes larger than that for member banks alone, and this larger figure was used thereafter.

4. Circulating deposits are the above total deposits, less time deposits and time and demand certificates of deposit; an estimated distribution of unclassified deposits is included in each category.

Dr. Lauchlin Currie, in "The Supply and Control of Money in the United States" (1934), pp. 31–33, reaches rather different estimates for circulating deposits on the June call dates for 1921–1932. Much of the present studies had been completed when this volume was published. Currie's figures exceed ours prior to 1927, and thereafter fall below them. It is believed that Currie's method as a whole is less reliable than the one used in preparing the figures given above. Currie depends partly on deposits of member banks as reported to the Federal Reserve Board. These reports are more carefully prepared than those made to the Comptroller of the Currency, except for National Banks, but cover roughly only two-thirds as many deposits. Currie estimates the deposits subject to check of nonmember banks by deducting *total* deposits of member banks (Federal Reserve Board Report) from the total deposits of all reporting banks (Comptroller's Report), and then applying to the difference a percentage based on the ratio of demand to total deposits in country state member banks. This entails the assumptions that deposits are similarly defined in the two sets of Reports and that the average nonmember bank resembles most closely the average country state bank. It is evidently possible to challenge both assumptions. On the other hand, it is believed that Currie's method of estimating float is more reliable than that used above, which takes no account of items in process of collection at the Reserve Banks. Currie also includes demand certificates of deposit in circulating deposits, whereas they have been excluded in the table above; it is believed that they actually resemble time certificates of deposit more closely than they do deposits subject to check.

In general, it was decided at the outset that for the purposes of the present studies it was desirable to use deposit data that should be comparable within themselves over as long a period as possible. This criterion required use of the Comptroller's Reports exclusively, since there is, of course, no way of correcting these Reports by the better but smaller Federal Reserve member bank sample prior to the war.

TABLE II

OUTSIDE CURRENCY AND CIRCULATING DEPOSITS, MONTHLY: 1919–1934
(In Millions of Dollars)

End of Month	Outside Currency	Circulating Deposits	Ratio H (1 + 2)	End of Month	Outside Currency	Circulating Deposits	Ratio H (1 + 2)
	1	2	3		1	2	3
1919				1923			
Jan.	3,930	16,680	0.236	Jan.	3,720	17,220	0.216
Feb.	3,930	16,910	0.232	Feb.	3,810	17,250	0.221
Mar.	3,950	16,980	0.233	Mar.	3,860	17,140	0.225
Apr.	3,940	17,510	0.225	Apr.	3,910	17,380	0.225
May	3,920	17,600	0.223	May	3,970	17,370	0.229
June	3,880	17,700	0.219	June	4,030	17,310	0.239
July	3,880	18,120	0.214	July	3,960	17,250	0.230
Aug.	3,940	18,130	0.217	Aug.	4,010	17,130	0.234
Sept.	4,020	18,730	0.215	Sept.	4,040	17,260	0.234
Oct.	4,100	18,590	0.221	Oct.	4,020	17,520	0.229
Nov.	4,220	18,460	0.229	Nov.	4,080	17,460	0.234
Dec.	4,240	19,100	0.222	Dec.	4,100	17,620	0.233
1920				1924			
Jan.	4,080	18,780	0.217	Jan.	3,870	17,650	0.219
Feb.	4,260	18,540	0.230	Feb.	3,980	17,520	0.227
Mar.	4,300	18,780	0.229	Mar.	4,010	17,680	0.227
Apr.	4,340	18,740	0.232	Apr.	3,960	17,750	0.223
May	4,370	18,680	0.234	May	4,000	17,710	0.226
June	4,390	18,660	0.235	June	3,940	18,170	0.217
July	4,390	18,450	0.238	July	3,840	18,400	0.209
Aug.	4,480	18,260	0.245	Aug.	3,930	18,680	0.211
Sept.	4,560	18,560	0.246	Sept.	3,920	19,150	0.205
Oct.	4,650	19,030	0.244	Oct.	3,970	19,430	0.204
Nov.	4,560	17,760	0.257	Nov.	4,050	19,520	0.207
Dec.	4,500	17,980	0.250	Dec.	4,030	19,600	0.206
1921				1925			
Jan.	4,340	17,570	0.241	Jan.	3,830	19,590	0.196
Feb.	4,230	17,470	0.242	Feb.	3,890	19,520	0.199
Mar.	4,130	17,590	0.234	Mar.	3,870	19,600	0.197
Apr.	4,090	17,290	0.237	Apr.	3,840	19,780	0.194
May	4,040	17,270	0.234	May	3,890	19,730	0.197
June	3,960	17,270	0.229	June	3,860	19,930	0.194
July	3,870	17,080	0.227	July	3,840	19,920	0.193
Aug.	3,830	16,730	0.229	Aug.	3,910	19,880	0.197
Sept.	3,840	17,020	0.226	Sept.	3,960	20,200	0.196
Oct.	3,810	16,830	0.226	Oct.	3,990	20,390	0.196
Nov.	3,780	16,640	0.227	Nov.	4,050	20,290	0.200
Dec.	3,820	16,570	0.231	Dec.	4,090	20,580	0.199
1922				1926			
Jan.	3,600	16,600	0.217	Jan.	3,860	20,440	0.189
Feb.	3,640	16,300	0.223	Feb.	3,910	20,300	0.193
Mar.	3,650	16,070	0.227	Mar.	3,880	20,140	0.193
Apr.	3,630	16,440	0.221	Apr.	3,920	20,140	0.195
May	3,620	16,570	0.218	May	3,930	20,190	0.195
June	3,630	16,510	0.220	June	3,890	20,180	0.193
July	3,590	16,650	0.216	July	3,920	20,340	0.193
Aug.	3,630	16,400	0.221	Aug.	3,950	20,370	0.194
Sept.	3,740	16,500	0.227	Sept.	3,990	20,920	0.191
Oct.	3,760	16,740	0.225	Oct.	4,040	20,940	0.193
Nov.	3,800	16,580	0.229	Nov.	4,060	20,960	0.194
Dec.	3,890	17,320	0.225	Dec.	4,110	21,380	0.192

TABLE II.—(*Continued*)

End of Month	Outside Currency	Circulating Deposits	Ratio *H* (1 + 2)	End of Month	Outside Currency	Circulating Deposits	Ratio *H* (1 + 2)
	1	2	3		1	2	3
1927				1931			
Jan.	3,870	21,280	0.182	Jan.	3,710	21,320	0.174
Feb.	3,890	21,420	0.182	Feb.	3,750	20,970	0.179
Mar.	3,860	22,090	0 175	Mar.	3,780	21,270	0 178
Apr.	3,880	22,150	0 175	Apr.	3,810	20,920	0.182
May	3,880	22,440	0 173	May	3,840	20,490	0.187
June	3,840	22,860	0 168	June	3,940	20,510	0 192
July	3,800	22,840	0.166	July	3,960	20,180	0.196
Aug.	3,860	22,670	0.170	Aug.	4,160	19,600	0 212
Sept	3,950	23,080	0 171	Sept.	4,340	19,610	0.221
Oct.	3,950	23,120	0 171	Oct.	4,630	18,700	0 248
Nov.	3,970	22,990	0.173	Nov.	4,660	18,170	0 256
Dec.	4,020	23,620	0 170	Dec.	4,780	18,210	0.262
1928				1932			
Jan.	3,720	23,520	0 158	Jan	4,790	17,470	0.274
Feb.	3,710	23,020	0.161	Feb.	4,770	16,880	0.283
Mar.	3,790	23,280	0 163	Mar.	4,650	16,800	0.277
Apr.	3,810	23,360	0.163	Apr.	4,740	16,320	0.290
May	3,840	23,230	0.165	May	4,690	16,400	0 286
June	3,910	23,360	0 167	June	4,900	16,120	0.304
July	3,800	22,920	0 166	July	4,960	15,520	0.320
Aug.	3,880	22,600	0.172	Aug.	4,950	15,580	0 318
Sept.	3,900	23,020	0 169	Sept.	4,940	16,300	0.303
Oct.	3,860	23,120	0.167	Oct.	4,920	16,300	0 302
Nov.	4,020	23,340	0 172	Nov.	4,940	16,190	0 305
Dec.	4,000	23,600	0 169	Dec.	4,960	16,110	0 308
1929				1933			
Jan.	3,730	23,350	0 160	Jan.	4,940	15,070	0.309
Feb.	3,780	23,070	0 164	Feb.	5,780	15,360	0 376
Mar.	3,830	23,250	0 165	Mar.	5,580	No data	No data
Apr.	3,800	23,000	0 165	Apr.	5,290	13,980	0 378
May	3,790	22,990	0.165	May	5,120	14,650	0 349
June	3,930	23,410	0 168	June	5,050	15,480	0 326
July	3,880	23,220	0.167	July	4,950	15,360	0.322
Aug.	3,970	22,950	0 173	Aug.	4,920	15,730	0 313
Sept.	3,940	23,240	0 170	Sept	4,950	15,000	0.311
Oct	3,940	23,350	0.169	Oct.	4,930	15,080	0.308
Nov.	4,000	24,000	0 167	Nov.	5,010	16,270	0.308
Dec.	3,920	23,320	0 168	Dec.	5,080	16,430	0.309
1930				1934			
Jan.	3,660	22,930	0 160	Jan.	4,580	17,150	0 267
Feb.	3,690	22,450	0.164	Feb.	4,620	17,720	0.261
Mar.	3,670	22,660	0.162	Mar.	4,660	18,110	0.257
Apr.	3,610	22,680	0 159	Apr.	4,640	18,200	0.255
May	3,680	22,480	0 164	May	4,640	18,210	0.255
June	3,660	22,660	0.161	June	4,660	18,900	0.246
July	3,580	22,320	0.160	July	4,630	19,090	0.242
Aug.	3,680	22,000	0 167	Aug.	4,700	19,120	0.246
Sept.	3,650	22,230	0 164	Sept.	4,760	19,340	0 246
Oct.	3,620	21,940	0 165	Oct.	4,760	19,280	0.247
Nov.	3,740	21,810	0 171	Nov.	4,840	19,370	0.250
Dec.	3,920	21,700	0 181	Dec.	4,690	20,420	0.230

The data in this table are interpolations between the items given in Table I, cols. 1 and 4, for June 30 call dates. Between the June call dates, samples secured from data for the other call dates were used as the basis for interpolations on call dates; and between the call dates themselves, smaller samples of monthly data were used to give monthly interpolations. Cols. 1 and 2 are computed to the nearest ten million.

For circulating deposits, the interpolation was as follows: For each call date, the circulating-deposits figure for all member banks was obtained. (For simplicity the call date was assumed to fall at the end of the month, and most of them actually did *fall within a few days of the end.*) *The circulating deposits of member banks* were deducted from those of *all* banks on the June 30 call dates, and an annual figure for such deposits in nonmember banks was thus secured. A monthly estimate for such nonmember deposits was secured by straight-line interpolation between the June 30th figures. The justification for this last is that figures obtained from the Federal Reserve Board for "total deposits" of member and nonmember banks on call dates, over a limited period, showed that the intrayear variations for the two types of banks agreed only 50 per cent of the time; hence straight-line interpolation for nonmember banks seemed more defensible than the only available alternative, which is to assume that nonmember deposits fluctuate with member-bank deposits. By adding the circulating deposits of member banks as reported on call dates to those of nonmembers as obtained by interpolation, we get estimated circulating deposits of all banks on call dates. For monthly figures between call dates, nonmember deposits as obtained by the above interpolation were again used, while for member banks circulating deposits were interpolated from reported "net demand" deposits.

The latter category, however, does not include United States deposits. United States deposits were therefore omitted in making the above interpolation of member-bank deposits, and were interpolated separately. United States deposits are reported for all member banks on call dates, but are not reported monthly. They are, however, reported by the group of weekly reporting member banks. (Weekly reports were from 101 centers to Mar. 1, 1933; thereafter they came from 90 centers.) These weekly reports, for the last Wednesday in each month, were used to interpolate United States deposits in all member banks between the call dates. This was done by finding the average ratio of such deposits in all member banks to those in weekly reporting member banks over long periods of time, and then multiplying the United States deposit figure for the given week at the end of the month by this average ratio. This procedure was adopted because both the ratio and United States deposits seem to vary widely even within a given month, so that merely interpolating the ratio between call dates would be inaccurate. The ratio used was changed in 1930, when reported United States deposits in all reporting banks began to exceed those in all member banks alone. United States deposits in Federal Reserve Banks, which varied widely, were also handled separately in arriving at monthly estimates of aggregate "circulating deposits" as above defined, as were deposits held in Federal Reserve Banks by foreign banks and by "others" (*i.e.*, nonbankers). These two categories of Reserve Bank deposits are reported monthly.

Outside currency is again a residual. Figures for June 30 call dates are obtained by deducting currency held in the Treasury as assets, currency held in Federal Reserve Banks or with Federal Reserve Agents, and vault cash of all reporting banks, from total currency issued and not yet redeemed. Monthly data are obtainable for the

sum of currency in outside circulation plus vault cash of all banks. Hence a monthly estimate of bank-vault cash is required; when obtained, it can be deducted from the sum just described, and the remainder will then be estimated outside currency monthly.

Bank-vault cash was estimated by using two assumptions. First, call-date data are available for *member* bank vault cash; and it was assumed that intracall date variations in this member bank vault cash are proportional to the intracall date variations in the *sum* of outside currency and vault cash in all banks—data on this sum being available monthly. Second, it was assumed that for nonmember bank vault cash a straight-line interpolation could be made between June call dates (the only dates for which figures are available on this item). Since nonmembers hold relatively more vault cash than members, this seemed safer than assuming that nonmember vault cash fluctuated with the (relatively wide) movements of the sum of outside currency and *all* vault cash. These procedures gave estimated monthly figures for all vault cash alone, and this permitted outside currency to be estimated monthly. The results are necessarily only an approximation. But the errors in the two estimates seem more likely to be offsetting than cumulative. During the years in question, vault cash averaged only about 22 per cent of outside currency, so that the errors affect only the much smaller component of the computations. No independent check from published data is now possible.

TABLE III

SEASONALS FOR OUTSIDE CURRENCY AND CIRCULATING DEPOSITS, MONTHLY: POSTWAR

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Outside Currency (1922–1930)	97.4	98.7	98.9	98 7	99 4	99.7	98 4	100 2	101 0	101 0	102.8	103.8
Circulating Deposits (1919–1932)	100 3	98 3	99 8	99.9	99.7	100 3	99.8	99 0	100 8	100 9	100 1	101 1

These seasonals are geometric averages, for the indicated periods, from the estimated monthly figures of Table II, these latter figures being expressed for each year in percentages of the average for the year. The seasonals are calculated for periods so selected that the original data begin and end at roughly the same levels. This eliminates most of the effect of trend from the seasonals, without the necessity of calculating the trend itself. This short-cut procedure is sufficiently accurate for present purposes. A more accurate short-cut procedure is described in Appendix C.

Other studies of the currency and deposit seasonals for various periods have been made, notably by Professors Kemmerer, Young, Hubbard, and Beckhart, which give results not seriously different from those in the above table. These other studies, however, include bank-vault cash in currency and in the main do not eliminate bankers' balances and the like from deposits. Thus they are not entirely comparable with the above table.

TABLE IV

DISTRICT RELATIVES OF MEMBER BANK CIRCULATING DEPOSITS, ON JUNE AND DECEMBER CALL DATES· 1918–1934

Call Date	New York	Chicago	Dallas	Atlanta	San Francisco	St. Louis	Cleveland	Philadelphia	Boston	Kansas City	Richmond	Minneapolis
1918: Dec. 31	.3520	.1225	.0511	.0357	.0591	.0357	.0857	0686	.0849	.0512	0415	.0319
1919: June 30	.3618	.1246	.0325	.0324	.0573	.0346	.0865	.0679	0834	.0508	.0383	.0298
Dec. 31	.3582	.1247	.0452	0371	.0720	.0371	.0790	.0640	.0799	.0537	.0395	0297
1920: June 30	.3578	.1270	.0406	.0333	0715	.0351	.0875	0655	0834	.0522	.0374	0288
Dec. 29	.3403	.1202	.0387	.0314	.0728	.0359	.0936	.0688	.0818	.0501	.0388	.0276
1921: June 30	3528	.1244	0354	.0291	.0687	.0361	.0905	.0691	.0818	.0484	.0364	0276
Dec. 31	3504	.1240	.0356	.0309	.0756	.0371	.0842	.0669	.0827	.0482	.0365	.0275
1922: June 30	.3456	.1294	.0352	.0305	.0726	0372	.0864	0658	.0839	.0513	.0349	0270
Dec. 29	.3394	.1282	.0378	.0334	.0755	.0404	.0857	.0671	.0830	.0500	.0354	.0272
1923: June 30	.3184	.1340	.0346	.0333	.0840	.0403	.0919	0679	.0842	.0497	.0354	0270
Dec. 31	.3150	.1317	.0424	.0361	.0813	.0407	.0892	.0670	.0836	.0482	.0380	.0264
1924: June 30	.3310	.1351	.0348	0325	.0787	.0394	.0902	.0670	0833	.0468	.0342	.0268
Dec. 31	.3374	.1332	.0386	.0350	.0778	0402	.0829	0644	.0812	0470	0346	.0273
1925: June 30	3321	.1373	.0364	0377	.0755	.0387	.0868	.0666	.0807	0481	0332	.0266
Dec. 31	.3321	.1310	.0377	.0444	.0774	.0405	.0821	0662	0807	0479	0344	.0256
1926: June 30	.3341	.1360	0345	.0381	.0747	.0397	.0866	0667	.0818	0479	.0339	0252
Dec. 31	.3397	.1316	.0366	.0372	.0777	.0395	.0821	0671	.0808	.0476	.0348	.0242
1927: June 30	.3445	.1351	0358	.0341	.0772	.0381	0853	.0656	.0797	.0471	.0342	0235
Dec. 31	.3483	.1355	.0392	.0345	.0785	.0390	.0803	0627	0794	.0468	.0335	0244
1928: June 30	.3423	.1395	.0386	.0335	.0806	.0376	0842	.0626	.0768	.0476	.0315	.0251
Dec. 31	3421	1387	.0421	0335	.0804	0385	.0812	0620	.0761	.0482	.0320	.0250
1929: June 29	.3571	.1392	.0380	0316	.0745	.0362	.0830	0637	.0740	.0466	.0312	.0248
Dec. 31	.3638	.1329	0378	0317	.0750	.0376	.0819	.0614	.0774	.0461	.0309	.0244
1930: June 30	.3620	.1377	0362	.0311	0716	.0365	.0844	.0658	.0756	.0464	.0299	.0248
Dec. 31	.3705	.1360	0342	.0305	0766	.0341	.0825	.0648	.0748	.0453	.0296	.0238
1931: June 30	.3721	.1530	.0339	.0310	.0732	.0350	.0814	.0689	.0737	0434	.0301	.0244
Dec. 31	.3934	.1258	.0326	.0294	.0729	.0336	.0762	.0682	.0720	.0429	.0300	.0231
1932: June 30	.4020	.1180	.0330	.0290	.0687	.0329	.0768	.0699	.0741	.0430	.0292	0234
Dec. 31	.4127	.1199	0319	0283	.0674	.0321	.0752	.0688	0736	.0407	.0289	.0205
1933: June 30	.4274	.1171	.0315	0269	.0709	0301	0663	.0656	0733	.0392	.0294	.0221
Dec. 30	.4097	.1246	.0348	0297	.0755	.0326	.0654	.0615	.0700	.0411	.0332	.0220
1934: June 30	.4086	.1280	.0359	0292	.0703	.0308	0678	0606	0714	.0419	.0338	.0219
Dec. 31	.3962	.1311	0359	0315	.0760	0325	.0709	0582	.0672	.0425	.0352	.0232

The estimate of circulating deposits given here is analogous to that in Table I above for all reporting banks, but refers to member banks only. Demand deposits as given in the Member Bank Call Reports, however, are not subdivided in the same way as are the demand deposits given in the Comptroller's Reports. Hence certain items, such as demand certificates of deposit, are probably included in circulating deposits in Table IV, but not in Table I. These items are relatively small.

Specifically, the data published by the Federal Reserve Board in the Member Bank Call Reports are used as follows for each district: demand deposits, United States deposits, letters of credit sold for cash, and travelers' checks outstanding are added together, and from this total the float is subtracted. This float includes items with the Federal Reserve Banks in process of collection, exchanges for the clearing-house, and other checks and cash items on other banks. This gives circulating deposits for each district on the call dates. The district relatives are the ratio of the circulating deposits of each district to the circulating deposits of the aggregate Federal Reserve system (also see the notes to Table II, above, on the latter total).

TABLE V

NEW YORK DISTRICT DEPOSIT RELATIVES, MONTHLY: 1919–1934

	1919	1923	1927	1931
Jan.	0.350	0.322	0.334	0.372
Feb.	0.328	0.323	0.329	0.371
Mar.	0.346	0.314	0.337	0.371
Apr.	0.381	0.314	0.341	0.366
May	0.342	0.306	0.344	0.373
June	0.362	0.318	0.344	0.372
July	0.344	0.314	0.342	0.379
Aug.	0.339	0.310	0.333	0.379
Sept.	0.351	0.316	0.333	0.384
Oct.	0.332	0.314	0.336	0.392
Nov.	0.335	0.315	0.341	0.390
Dec.	0.338	0.315	0.348	0.393
	1920	1924	1928	1932
Jan.	0.321	0.315	0.349	0.402
Feb.	0.324	0.316	0.342	0.386
Mar.	0.333	0.315	0.345	0.384
Apr.	0.335	0.319	0.346	0.396
May	0.335	0.321	0.349	0.406
June	0.338	0.331	0.342	0.402
July	0.332	0.332	0.340	0.416
Aug.	0.323	0.331	0.331	0.402
Sept.	0.330	0.330	0.330	0.407
Oct.	0.325	0.327	0.331	0.405
Nov.	0.324	0.333	0.336	0.408
Dec.	0.340	0.337	0.342	0.413
	1921	1925	1929	1933
Jan.	0.329	0.330	0.348	0.409
Feb.	0.330	0.327	0.346	0.392
Mar.	0.343	0.322	0.348	No data
Apr.	0.324	0.332	0.350	0.418
May	0.345	0.331	0.353	0.426
June	0.353	0.330	0.357	0.427
July	0.337	0.332	0.351	0.431
Aug.	0.338	0.330	0.349	0.436
Sept.	0.345	0.333	0.346	0.408
Oct.	0.344	0.332	0.353	0.401
Nov.	0.347	0.330	0.381	0.413
Dec.	0.350	0.332	0.364	0.410
	1922	1926	1930	1934
Jan.	0.346	0.328	0.356	0.407
Feb.	0.337	0.323	0.350	0.406
Mar.	0.340	0.323	0.356	0.408
Apr.	0.340	0.326	0.355	0.409
May	0.345	0.330	0.358	0.404
June	0.346	0.334	0.362	0.409
July	0.337	0.327	0.360	0.402
Aug.	0.331	0.327	0.361	0.400
Sept.	0.329	0.326	0.360	0.396
Oct.	0.329	0.326	0.362	0.393
Nov.	0.330	0.329	0.370	0.390
Dec.	0.335	0.340	0.370	0.396

To obtain the New York district relatives on a monthly basis, it was first necessary to interpolate circulating deposits between the call-date figures. Figures for all call dates were obtained by the method outlined in Table IV. Then circulating deposits were separated into United States deposits and all other deposits subject to check; this was done because the movements of United States deposits were more irregular than those of other deposits subject to check. "All other" circulating deposits were then interpolated monthly on the basis of the fluctuations of "net demand" deposits as reported monthly; and United States deposits were interpolated from the United States deposits of weekly reporting member banks. The two groups of interpolations were then added together, to give estimated New York district circulating deposits on a monthly basis. The New York district deposit relatives are the ratio of these deposits to the circulating deposits of the aggregate Federal Reserve system, similarly interpolated (also compare Tables II and IV).

TABLE VI

INDICES OF THE EXCHANGE VELOCITY OF CIRCULATING DEPOSITS, MONTHLY: 1921–1934

	New York City			140 Cities			141 Cities		
	1921	1926	1931	1921	1926	1931	1921	1926	1931
Jan.	57.3	71.1	51.5	30 4	36.6	31 8	41 6	49 2	39.7
Feb.	47.9	65 3	50.9	28.4	34.5	29.1	36.6	45.4	38.2
Mar.	47.5	71.5	54.2	28.5	33 6	28.8	35.7	47.4	34.5
Apr.	43.6	69.6	56.1	26.4	36.8	29.0	33.5	47.1	40.6
May	48.6	63.0	51 5	25 3	31 8	28.0	34.8	43.2	38.2
June	47.9	63 7	52 3	25 5	31.9	28.7	34.9	43 3	41.7
July	46.3	63 0	46.4	25.3	34.0	27 3	35.2	44 5	35.3
Aug.	41.0	62.7	41.6	24.2	31.0	24 9	31.6	42 8	30 5
Sept.	44 9	59.7	41.3	25 8	31.0	25 8	34.5	41 9	32.5
Oct.	46 0	69.4	44 0	29 4	36 0	28 8	37.4	47.2	33.9
Nov.	53.0	67 7	40 6	29 8	35 2	27.9	39.3	46.0	32.3
Dec.	53 7	62 9	41 0	27 4	35.1	28.1	38 4	46 1	33 3
	1922	1927	1932	1922	1927	1932	1922	1927	1932
Jan.	54 7	75.8	42 9	28.5	36 9	29 8	40 2	51 0	35 7
Feb.	49.6	74.2	38 6	28 4	36 4	25 8	37 5	50.5	31 5
Mar.	53.0	75 0	39 7	26 9	35 0	25.0	37.8	49.3	31.4
Apr.	58.6	74 7	37 8	28.1	35.9	25.8	40.7	49.9	31.1
May	54.5	71.0	33.1	27.5	34.6	23.4	39.4	47.8	27.6
June	53 4	71.1	35 8	27.2	34.7	23.3	38 5	48.5	28 7
July	52.2	71 0	34.0	28.4	30.3	24.7	38 8	48.9	28.8
Aug.	45 3	67 8	33 0	25 2	31 6	21.4	33.7	45.3	26.7
Sept.	50.8	74.5	35 4	27 2	34.8	21.6	36.9	49.6	27.7
Oct.	60.1	76.2	32 6	29.6	38.1	22.7	41.4	51 6	27.0
Nov.	56.8	79.3	26.7	29.9	37.2	21.4	40.5	52.1	23.7
Dec.	51.6	75.9	30.5	30.9	36.1	20.7	39.0	51.2	19.9
	1923	1928	1933	1923	1928	1933	1923	1928	1933
Jan.	58 1	85 4	32.2	31.2	40.2	24.2	44.2	57.1	27.4
Feb.	57 7	78.6	30.9	32.3	36.2	19 8	45.1	52.6	24.9
Mar.	57.4	88.7	No data	30.5	35.9	No data	43.4	55.7	No data
Apr.	58.8	91.2	31.4	32.9	37.6	29.1	45.1	58.2	27.3
May	54.6	94 3	32 7	30 2	38 0	23 9	41.6	59.6	26.8
June	57.6	92.0	33.7	32 7	39 0	22.0	44.6	60 5	28 0
July	55.0	83.9	41.6	32.5	40.7	23.8	43.6	55.2	32 7
Aug.	44.7	76.6	29.5	28.0	33.0	21.0	36 7	48.8	24 5
Sept.	47.4	92 0	28 7	30.7	38.4	19 6	40.3	57.9	24.2
Oct.	52.7	101 9	31 1	32.6	40.6	22 4	42.8	59 2	26.5
Nov.	60.9	111.7	31.6	34.5	40.7	21.7	47 4	68.8	26.2
Dec.	60.1	116.1	29.0	34.1	42.7	21.5	46.8	70 3	24 9
	1924	1929	1934	1924	1929	1934	1924	1929	1934
Jan.	60 5	118 4	33 5	35.5	41 7	22.1	44.9	74 9	27.2
Feb.	59 2	117.8	33.7	33 5	40.8	20.9	43 4	73.9	26.6
Mar.	56.6	120.5	30 3	32.6	39.9	20.0	41.9	74.5	24 7
Apr.	52.7	109.7	35 2	33.2	40.7	24.1	43.3	70 8	28 3
May	54.5	110.3	28.6	30.9	39 1	20 6	40.0	69 1	25.2
June	53 1	95 2	29.5	31.5	38 6	19.9	40 9	64.4	24.5
July	52.2	108.9	29.4	31.1	40.2	14.2	39.8	70.7	25.3
Aug.	48.7	104.2	23.9	25.5	38 3	17 9	36.9	67 2	22.6
Sept.	48.6	116.9	23.8	29.8	40 3	18 9	37 6	73.5	21 2
Oct.	49 9	126 4	24 5	31 5	44.4	19 6	41.2	81.4	22 0
Nov.	59 6	117.6	25.5	33.7	45.2	20.3	44 3	79.6	22.6
Dec.	57 0	81.3	28.4	33.0	39 7	20.7	44.0	60 3	24.2
	1925	1930		1925	1930		1925	1930	
Jan.	60.2	73.9		34.0	37.8		44 6	51.5	
Feb.	60.8	76.1		32.9	37.9		44.0	54.4	
Mar.	60.3	86.8		32.1	36.5		42.7	56.5	
Apr.	56.1	86.0		33.0	37 3		44.0	56.0	
May	51.6	79.5		31.2	35.3		42.4	52.4	
June	61.9	78.7		32.5	35.8		43 6	52.4	
July	59.1	65.0		32.5	33.7		42.5	46.2	
Aug.	53.8	52.8		29.9	30 0		39.0	39.1	
Sept.	55.2	54.5		31.5	30.7		40.4	43.0	
Oct.	63.5	64.1		34.5	34.3		45.3	46.5	
Nov.	71.4	55.6		36.2	34.8		49.3	43.6	
Dec.	66.1	52 9		34.6	31.1		46.5	42.0	

All original data are from the Annual Reports of the Federal Reserve Board and its weekly press releases, and the *Federal Reserve Bulletin*. The exchange-velocity figures are debits to individual account divided by circulating deposits, the two latter series being adjusted as follows:

Debits to individual account have been published weekly (week ending Wednesday) for 141 cities since Dec. 26, 1923. For the preceding years 1921–1923, we used a series beginning Aug. 15, 1919, for a larger but varying number of centers (now about 270), multiplied by 0.937, the average ratio between the 141-cities series and the larger series in 1925–1929.[1] The larger series includes debits to bankers, which it is desired to exclude here as far as possible. The 141-cities series covers debits to demand *and time* accounts held by individuals, firms, and government bodies. To exclude debits to time accounts, we have, for lack of any other basis, followed Dr. W. R. Burgess's estimate (*Journal of the American Statistical Association*, 1923, pp. 727–740), and have assumed that time deposits turn over twice a year. We then made a corresponding subtraction from the weekly debits figures as reported, subtracting time deposits of weekly reporting banks divided by 26. The debits figures thus adjusted were then reduced to a weekly average working-day basis, allowing for 12 holidays per year. Finally, to make the velocity figures easier to handle, these weekly averages of working-day figures were multiplied by 302, the average number of working days per year—thus giving their annual equivalent, the volume of debits that *would* be reported per year if the average daily volume in the given week were maintained for a year. (Any other constant multiplier could have been used.)

The available data report debits for New York City, for 140 outside cities, and for the total of 141 cities. The adjustments just described were made for each group of debits separately.

Circulating deposits were estimated on a weekly basis by taking "net demand" deposits as reported weekly by a group of member banks, subtracting from this any excess of "net due to banks" over estimated exchanges (if the differences was negative no correction was made), and adding United States deposits. The number of banks reporting deposits weekly varied, in 1921–1928, from about 800 down to 626 at the end of 1928 (later figures not available). To Mar. 1, 1933, these banks were in 101 leading cities, but thereafter in 90. A corresponding adjustment has been made in the velocity figures for 1933–1934, based on the ratio between the 101- and the 90-city series in 1932 (a reduction of 14.9 per cent for banks outside of New York City, 7.6 per cent for the whole country, none for New York City).

The net demand deposits figures were slightly revised in 1929 (*Federal Reserve Bulletin*, 1929, pp. 6–8, 51–91, 96), and the revisions for 1927–1928 were published; the revisions for 1921–1926 are available at the Federal Reserve Board. The weekly reporting bank sample of net demand deposits is fairly stable; at the June call dates, 1920–1932, it averaged 71.3 per cent of all member-bank deposits, with a range from 68.6 to 74.6 per cent.

In the weekly reports, "exchanges" are not included with the other "due from banks" items. Since this item is relatively large and fluctuating, it cannot be ignored.

[1] The Federal Reserve Board has now revised the 141-center series and has made it available in mimeographed form. The differences between these data and our estimates for 1921–1923 are small and fairly uniform. For the purposes of the present exploratory studies, it did not seem worth while to recompute the velocity figures given in Table VI. The revised 141-center series goes back to January, 1919.

We have interpolated it from debits, on the basis of the ratio between exchanges at call dates (the only dates for which they are reported) and weekly debits to individual accounts in the weeks containing those dates. For the country as a whole, in 1919–1932, this ratio averaged 17 per cent, with a range from 9 to 30 per cent.

Bankers' balances before 1923 were estimated from monthly figures. Circulating deposits as thus estimated weekly are not strictly comparable with those estimated on monthly and annual bases and presented in earlier tables, but no practicable way could be devised for getting more accurate weekly figures. The effect of these inaccuracies on the estimates of the *relative* short-period fluctuations of deposit-exchange velocity is not so great as might at first be feared, since these latter fluctuations are associated primarily with fluctuations in debits, not in deposits.

The velocity indices were originally computed on a weekly basis. The table above gives monthly averages of these weekly figures.

TABLE VII

SEASONALS FOR THE EXCHANGE VELOCITY OF CIRCULATING DEPOSITS, SEMIMONTHLY: 1921–1934

Half month	January, 1921–November, 1929			November, 1929–December, 1934		
	New York City	140 Cities	141 Cities	New York City	140 Cities	141 Cities
Jan.: 1	118 1	115.3	119 0	109.4	119.0	112.5
2	101.4	97.8	101.3	92.5	93.3	90.9
Feb.: 1	103.0	98.1	102.7	97.2	94 1	96.0
2	106 0	105 1	106 9	104.0	101.8	101.2
Mar.: 1	107.2	99.3	104 5	107.0	100.6	102.1
2	106 7	96 2	102.8	106 6	94.3	97.2
Apr.: 1	105 9	104 0	106.9	114.7	112.8	110.6
2	105 4	100.3	101.5	105.8	100.4	101.9
May: 1	107 8	97.7	102.8	110 0	103.2	106.6
2	98 0	94 1	97.3	94 7	97 7	93.1
June: 1	104.4	100 8	103 3	104.9	101.1	105.9
2	101.0	95 1	97 3	109 5	98.6	102.9
July: 1	106.0	105 7	106 7	115 4	106 8	112 9
2	90 0	93.5	92 1	97 9	94 9	95.7
Aug.: 1	91.9	89 7	92.3	95 0	94.3	95.3
2	84 5	85 8	86.7	84 6	88.1	84 1
Sept.: 1	91.9	93.1	94.0	87.8	90 7	88.6
2	94.0	95.3	97.3	97.7	95.2	97.1
Oct.: 1	103 6	102 5	103.2	103 2	106.9	100.0
2	101.1	101.1	103.4	95.3	98 5	96.4
Nov.: 1	112.5	108.3	112.8	99 6	104.8	99.1
2	104.8	100.2	103.3	88 0	102.5	94.6
Dec.: 1	109.4	103.4	105.6	92.4	97.7	95.3
2	103.7	102 0	104 3	101.7	101.1	101.1

These seasonals are semimonthly arithmetic averages of the figures remaining after division of the original velocity indices by their computed trends. The velocity indices were originally computed weekly, by the method explained for Table VI. The data used in computing the seasonals are semimonthly averages of these weekly figures. When the month had five reporting weeks, the middle week was divided equally between the first and the second halves of the month.

TABLE VIII

THE CIRCULAR VELOCITY OF MONEY AND RELATED SERIES, ANNUALLY: 1909–1932

Year	Total Money	Circulating Money	National Income			C, Circular Velocity of Total Money, Based on			C_1, Circular Velocity of Circulating Money, Based on			Percentage Year-to-Year Changes in		
			King	Copeland	Kuznets	King	Copeland	Kuznets	King	Copeland	Kuznets	Circulating Money	National Income (King, Kuznets)	C_1 (King, Kuznets)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1909	15 31	8 53	27.7	....	....	1.81	...	....	3.25	....	. .	. ..	... ..	.....
1910	16 39	9.39	29 3	....	....	1.79	....	. ..	3.13	...	....	+10 5	+ 6.0	− 4 0
1911	17.21	9.85	29.7	....	...	1.73	....	....	3.01	...	....	+ 5.0	+ 1.5	− 4.0
1912	18.33	9.92	31.8	....	....	1.74	....	....	3.20	..	....	+ 1.0	+ 7.0	+ 6 5
1913	18.84	9.79	33.4	31.5	....	1.77	1.67	....	3.40	3.22	....	− 1.5	+ 5.0	+ 6.5
1914	19 93	11.18	33.2	31.3	. .	1.66	1.50	....	2.97	2.80	. .	+14.0	− 0 5	−13.0
1915	20.74	11 13	34.7	32.8	...	1.67	1.58	....	3.11	2.95	....	− 0.5	+ 4.5	+ 4.5
1916	24.39	13.95	40 6	38.5	....	1.67	1.58	....	2 91	2.76	....	+24 5	+17.5	− 6.5
1917	28 67	15.59	48 3	44 9	....	1.68	1.56	....	3.10	2.89	....	+11.5	+19.0	+ 6.5
1918	32 19	18 64	56.7	51.9	....	1.76	1.61	....	3.04	2.78	....	+19.5	+17.5	− 2.0
1919	36.67	21.88	61.6	57.2	....	1 68	1.56	....	2.81	2.61	....	+17.0	+ 8.5	− 6.5
1920	41.05	22.93	68.4	65 5	....	1.67	1.60	....	2.99	2.85	....	+ 3 0	+11 0	+ 6.0
1921	38.59	21 08	58.3	55 8	...	1.51	1 42	....	2.76	2.64	....	− 8.0	−15.0	− 7 5
1922	40.02	20.24	61.2	59.0	....	1.53	1.48	....	3 03	2.91	....	− 4.0	+ 5.0	+ 9 5
1923	43.58	21.31	69 3	67.1	....	1.58	1.54	....	3.25	3.15	....	+ 5 5	+13.5	+ 7.5
1924	45 80	22.40	71.9	69.6	. ..	1.57	1.52	....	3.21	3.11	....	+ 5.0	+ 3 5	− 1 0
1925	49 35	23.87	76.6	74 3	....	1.68	1.64	....	3.21	3.12	....	+ 6.5	+ 6.5	0
1926	51.61	24.47	80 3	77.9	....	1.56	1.51	....	3.29	3.19	....	+ 2.5	+ 4.5	+ 2 0
1927	54.15	26 43	82.9	79 7	....	1.52	1.46	....	3.14	3 01	....	+ 8 0	+ 3.5	− 5.0
1928	56 55	26 93	84.1	81.0	....	1.49	1.43	....	3 14	3.01	....	+ 2.0	+ 1 5	0
1929	56.48	27.14	...	....	83.0	....	....	1 47	...	. .	3 05	+ 1.0	(+ 2.0)	(+ 1 0)
1930	55 98	26 01	....	....	70.3	....	....	1.26	....	....	2 70	− 4.0	−15.0	−11 5
1931	53 93	24 11	....	....	54.6	....	....	1.01	....	....	2.26	− 7.0	−22.5	−16.5
1932	46.15	21.18	....	....	39.4	....	...	0.85	....	....	1.86	−12.0	−28 0	−18.0

Columns 1 to 5 are in billions of dollars.

Because of the shift in the basis of the national income estimates between 1928 and 1929, the entries for 1929 in Columns 13 and 14 presumably have little significance.

Sources: *National income:* W. I. King, "The National Income and Its Purchasing Power" (1930), p. 74, excluding "imputed" income; M. A. Copeland, The National Income and Its Distribution, in "Recent Economic Changes" (1929), Vol. II, p. 763, using his "money income"; Simon Kuznets, "National Income, 1929–1932" (1934), p. 10, using his "income produced." *Total money:* from Table I; on June call dates. *Circulating money:* 1909–1918, from Table I; on June call dates, 1919–1932, from Table II; annual averages of monthly figures.

TABLE IX

EXCHANGE VELOCITY DIVIDED BY CIRCULAR VELOCITY, AND MONEY VOLUME OF NEW YORK STOCK SALES, ANNUALLY: 1921–1932

Year	Indices of Exchange Velocity of Bank Deposits		Circular Velocity of Circulating Money	Ratio L		Money Volume of Stock Sales, New York Stock Exchange, Billions of Dollars
	141 Reporting Cities	140 Outside Cities		1 ÷ 3	2 ÷ 3	
	1	2	3	4	5	6
1919	....	....	2.81	.....	.....	23
1920	...	....	2.99	.....	.....	15
1921	36 1	26.8	2.76	13.10	9 70	10
1922	38.7	28.2	3.03	12.75	9.30	17
1923	43 4	31.9	3.26	13.30	9.80	17
1924	41.4	32.1	3.21	12.85	10 00	21
1925	43.7	32.9	3.21	13.60	10.20	45
1926	45.5	34.0	3.29	13 85	10.35	49
1927	49 6	35 6	3.14	15.80	11.30	79
1928	58.6	38 7	3 14	18.70	12.35	150
1929	71.7	40.8	3.05	23 50	13.40	235
1930	48.6	34.8	2.70	18.00	12 90	137
1931	36 3	28.2	2 26	16.00	12.45	62
1932	28 7	23 8	1.86	15.40	12.80	21

Sources: Columns 1 and 2 are annual averages of the data presented in Table VI. Column 3 is copied from Table VIII (Cols. 9 and 11). Column 6 is annual totals of monthly figures: number of shares sold on the New York Stock Exchange, multiplied by the *New York Times* dollar index of stock prices. These latter figures are, of course, seriously defective in certain respects, but are usable for the present rough purpose; see the comments on them in a footnote accompanying Chart IX in Chapter II.

Appendix C

NOTES ON THE COMPUTATION OF SEASONAL INDICES AND TRENDS

I. THE COMPUTATION OF SEASONAL INDICES; A SHORT-CUT METHOD

IN COMPUTING seasonal indices, the choice of method must be governed not only by the degree of accuracy at which it seems worth while to aim, but also—particularly if short cuts are to be used—by the internal characteristics of the data. The most accurate but also the most laborious procedure of course entails the fitting and removing of a defensible trend for the period selected; a comparatively quick method of trend fitting is described in the next section of the Appendix. If the trend is fitted directly to the raw data, the appropriate procedure is to divide the raw data by the computed trend values, thus obtaining residuals which are expressed in percentages of the trend, and then, assuming monthly data, to obtain the average of these residuals for all the Januarys, all the Februarys, and so on. (The geometric average should be used if the extreme variations are marked.) The resulting twelve monthly averages comprise the desired monthly indices of seasonal variation, expressed in percentages of an average of the raw data. Dividing the raw data by these indices gives the data adjusted for seasonal; and dividing the seasonally adjusted data by the computed trend values gives cycle-accidental residuals, expressed as percentages of the trend, which are likewise adjusted for seasonal.

This is the general procedure that was used in Chapter IV in handling the data on exchange velocity. Two comments, however, should be made. First, with economic statistics better results are generally obtained by converting the raw data to logarithms at the outset and by conducting sub-

sequent operations in terms of the logarithms; this usually gives a more nearly normal distribution of the deviations from the computed trend, and hence a better seasonal index, than does direct use of the raw data. Second, if there are marked nonseasonal fluctuations in the raw data of an even roughly cyclical character, the above procedure will give unrepresentative results unless the time period covered by the data is so selected as to delimit approximately two or more whole cycles. Whatever the number of apparent cycles included in the period, it must be *a whole* number greater than one, or there is likely to be a distortion of the seasonal index obtained.

In many studies, however, the determination of a trend is of no immediate value in itself, and the processes just described are therefore likely to seem needlessly laborious. Results that are sufficiently accurate for most purposes in economic statistics can usually be obtained, without computing a trend, by the following short-cut methods, provided the time period covered by the raw data is again so selected as to delimit approximately two or more apparent whole cycles in the data, if such cycles exist. Here again the procedure is easier and better results are secured if the raw data are first converted into logarithms.

1. *When the raw data begin and end at about the same levels of magnitude*, determine the averages of the logarithms of the data for all the Januarys, all the Februarys, and so on; subtract the general average of all the logarithms from each of these averages; and take the antilogs of the remainders. The result is a fairly good index of seasonal variation, expressed (after multiplication by 100) in percentages of the geometric average of the raw data. This method was used in Chapter II in obtaining the seasonals for outside currency and for circulating deposits.

2. *When there is a marked net displacement (net rise or fall) in the apparent trend of the raw data*, a further step is necessary. This net displacement will distort the seasonals as just computed, and it must be removed. Let A, B, and G, respectively, be the geometric averages of the raw data for the first twelve months, for the last twelve months, and for the series as a whole (already determined); let n be the number of observations; and let e be the net trend displace-

ment per month, expressed as a percentage of the geometric average for the whole series. Then:

$$e = \frac{\frac{B-A}{n}}{G} = \frac{B-A}{nG}.$$

This monthly correction factor can now be used to adjust the seasonal indices obtained under (1) above, as follows: The adjustment at the middle of the year is, of course, zero. If we suppose that e is positive (signifying a net rise in the apparent trend), then the values of the seasonal indices obtained under (1) are too low in the first half of the year and too high in the second; they should be adjusted by successively larger positive and negative multiples of e, respectively, with the middle of the year taken as origin. But the middle of the year falls between two months, whereas the seasonal index is representative of the middle of the month. Therefore, assuming e to be positive, *add* $0.5e$ to the seasonal index previously obtained for June, $1.5e$ to that for May, and so on back to $5.5e$ to that for January; and *subtract* $0.5e$ from the index for July, $1.5e$ from that for August, and so forward to $5.5e$ from that for December. (If e itself is negative, reverse these signs.)

This procedure adjusts the several months by amounts that successively decrease or increase by equal quantities. The end result is to make a rough adjustment of the seasonal indices as computed under (1) for the net trend displacement. The correction process is, of course, only an approximation, and is faulty to the extent that the geometric average of the raw data as a whole differs seriously from the average of the averages for the first and the last twelve months. It therefore cannot appropriately be applied to all series. But for the great bulk of economic series covering more than a few years, the term $(B - A)$ in the above formula is so small relative to the term (nG) that this correction process will give results that are sufficiently accurate for most purposes.

American economic statisticians have frequently used the so-called "link relative" method for computing seasonals as a short cut, without prior removal of a trend. This method is very laborious, and its results cannot be tested

for mathematical significance; it would probably be better to abandon its use entirely in obtaining seasonals. Use of a moving average as a short cut for this purpose also seems undesirable. It too is laborious to compute. In addition, it reduces extreme fluctuations even though they are regularly recurrent; it has some tendency to shift the location of peaks and valleys; and, unless arbitrarily adjusted, it fails to remove the net trend displacement.

II. DESCRIPTION OF A SHORT METHOD FOR FITTING TRENDS OF ANY DEGREE

The trends given in the preceding chapters were all computed in terms of the orthogonal polynomials introduced by the Russian mathematician Tchebycheff, through the use of an improved method given by R. A. Fisher in his "Statistical Methods for Research Workers" (5th ed., 1934), pp. 139–148. This method was developed from an application of the calculus of finite differences to orthogonal polynomials, but the principal procedures involved in its use require nothing more exacting than addition and subtraction. It has the further tremendous advantage that, when a curve of degree n has been fitted to the original data, a curve of degree $n + 1$ can be obtained by putting through only one additional set of operations—instead of having to start the whole computation over, as is necessary with the ordinary least-squares method. This makes the method much less laborious than others in fitting curves above the first degree, and renders it a peculiarly flexible and powerful tool for experimental and exploratory work. Moreover, all the computations can and should be done on an adding machine (which should also have a device for subtraction), and hence appear on the machine tape. This eliminates the labor and probable inaccuracy of separate tabulation and makes checking easy. The method seems to be little known among economic statisticians in this country. In view of the difficulty for non-mathematicians of interpreting some parts of Fisher's exposition, it seems worth while to give here a brief description of the procedures actually involved in a concrete case.[1]

[1] I am indebted to my colleague Professor Harold Hotelling for calling my attention to this method. He has also kindly read the present summary. This sum-

The reader may be reminded first of the comments made in Chapter II, Sec. III, on the general problem of trend fitting. In economic statistics, the trend selected should usually be of the lowest degree consistent with a reasonably representative picture of the apparent central tendency of the raw data; and, except when it is being deliberately used for experimental purposes, it should usually be computed only for a period which is reasonably homogeneous with respect to the forces that can be supposed to have had a dominant influence on the raw data over time—forces whose effect the trend itself, *qua* trend, must be presumed to summarize with some accuracy.

The use of the method as described by Fisher does not require the actual construction or solution of equations, but merely entails processes of continuous algebraic summation. From these summations certain quantities a, b, c . . . are obtained and from them, quantities a', b', c'. . . . The latter quantities in turn yield, through formulas, the final ordinate of the computed trend and the final first, second, third . . . differences of the trend ordinates. The actually dissimilar values of the last degree of difference used are treated as all equal to the final value for this degree of difference—which, as just stated, is computed directly from the a', b', c' . . . quantities. The other differences and the other ordinates of trend can therefore be built up by simple algebraic addition from the computed final differences and the computed final ordinate of trend. This algebraic addition proceeds backward and upward, as it were: from the final third and the final second differences, say, upward to all the other second differences; from these and the final first difference to the other first differences; and from these and the final ordinate of trend to the other ordinates of trend. The final differences and the final ordinate of trend, already computed, give in each case the base from which the upward addition starts, beginning with the chronologically last value in each series and ending with the first (assuming that the other variable is time). The

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mary is a condensation of a more detailed description prepared by two of my assistants in the present studies, Dr. Caroline Whitney and Mr. P. B. Nortman. I can make no pretense of comprehending the underlying mathematics myself.

accompanying table gives a short example, in which a third-degree curve is fitted. For simplicity, the curve is fitted directly to the original data. As remarked in the preceding section, however, it is in general better to fit to the logarithms of the data, since this usually gives a better distribution of the deviations from the computed trend.

LOANS AND INVESTMENTS OF ALL REPORTING BANKS IN THE UNITED STATES, ANNUALLY: 1890–1899
(In Billions of Dollars)
(A third-degree curve is to be fitted)

Year	x	y	First Summations	Second Summations	Third Summations	Third-Degree Trend Ordinates	First Differences	Second Differences	Third Differences
1	2	3	4	5	6	7	8	9	10
1890	1	5 03	5 03	5 03	5 03	4.95653			
1891	2	5.21	10 24	15.27	20.30	5 36186	−0 40533		
1892	3	5 62	15.86	31.13	51.43	5 57144	−0 20958	−0.19575	
1893	4	5.73	21.59	52 72	104 15	5.65377	−0 08233	−0 12725	
1894	5	5.53	27.12	79 84	183 99	5.67735	−0 02358	−0.05875	
1895	6	5 83	32 95	112 79	296.78	5.71068	−0 03333	+0.00975	
1896	7	5.93	38 88	151.67	448.45	5 82226	−0 11158	+0.07825	
1897	8	5 95	44 83	196.50	644 95	6.08059	−0 25833	+0 14675	
1898	9	6 51	51.34	247.84	892 79	6.55417	−0.47358	+0 21525	
1899	10	7 36	58 70	306 54	1199.33	7 31150	−0.75733	+0.28375	−0 06850
Totals		S_1 = 58 70	S_2 = 306.54	S_3 = 1199 33	S_4 = 3847.20	Check: 58.70015			

In this table col. 2 is time in years (x), and begins with the value 1 (not with 0). Column 3 is the magnitude (y), which varies through time, here loans and investments of all reporting banks. These are the only columns which need to be transcribed. Column 4 is obtained on an adding machine by subtotaling; the first item is copied from the first item in col. 3, the second is the sum of the first two items in col. 3, the third is the sum of the first three items in col. 3, and so on. Use of the adding machine and subtotaling permits these summations to be put through in a continuous operation, each step in which appears on the

machine tape.[1] Column 5 is similarly obtained from col. 4, and col. 6 from col. 5. S_1, S_2, and S_3 are, respectively, the last subtotals in cols. 4, 5, and 6, and are therefore also the *sums* of the preceding cols. 3, 4, and 5. For a third-degree curve, it is also necessary to sum col. 6; this sum is S_4. This is as far as it is necessary to go to get a third-degree curve, but the process can be carried on to get a curve of any desired degree. For each higher degree of curve, all that is required is to compute one more column of continuous summations, and then to sum this column. By carrying the computations through the sum S_n, a curve of degree $n - 1$ can be obtained.

The quantities a, b, c . . . and a', b', c' . . . must next be determined, preparatory to computing cols. 7, 8, and 9. Let n' be the number of observations, here 10. The formulas for a, b, c . . . , and their numerical values in the above example, are:

$$a = \frac{1}{n'}S_1, \qquad 5.8700$$

$$b = \frac{1 \cdot 2}{n'(n'+1)}S_2, \qquad 5.5734$$

$$c = \frac{1 \cdot 2 \cdot 3}{n'(n'+1)(n'+2)}S_3, \qquad 5.4515$$

$$d = \frac{1 \cdot 2 \cdot 3 \cdot 4}{n'(n'+1)(n'+2)(n'+3)}S_4. \qquad 5.3807$$

Analogous formulas for the quantities e, f, g . . . , needed in fitting curves above the third degree, can be constructed

[1] The beginning and end of the tape for col. 4 look like this:

503
503*S*
521
1,024*S*
562
1,586*S*
.
.
.
651
5 134*S*
736
5 870*S*
5,870*

on the same model. Note that one more such quantity is required than the degree of the desired curve.

The quantities a', b', c' . . . are obtained from a, b, c . . . by the following formulas, again with numerical values from the above example:

$a' = a,$	5.8700
$b' = a - b,$	0.2966
$c' = a - 3b + 2c,$	0.0528
$d' = a - 6b + 10c - 5d.$	0.0411

The procedure in obtaining formulas for the quantities e', f', g' . . . , required for curves of higher degree, is as follows: The first term in these formulas is always a. The coefficients of the b terms in the successive formulas are given by the general expression $\frac{r(r+1)}{1 \cdot 2}$, where r is the successively higher degrees of those curves, for which b', c', d' . . . successively represent the last quantities of this category which it is necessary to compute. (The quantity b' is the last one required for a first-degree curve, c' for a curve of second degree, d' for one of third degree, and so on.) Hence the numerical values of the coefficients of b become successively higher in the successive formulas for b', c', d'. . . . The successive coefficients of the c terms in the formulas are the coefficients of the corresponding b terms multiplied by $\frac{(r-1)(r+2)}{2 \cdot 3}$. The successive coefficients of the d terms in the formulas are the coefficients of the corresponding c terms multiplied by $\frac{(r-2)(r+3)}{3 \cdot 4}$; and so on. In general terms, the rule for the formation of the successive coefficients is to multiply each successively (in order to pass from the b coefficients to the c coefficients, from them to the d coefficients, and so on) by

$$\frac{r(r+1)}{1 \cdot 2}, \frac{(r-1)(r+2)}{2 \cdot 3}, \frac{(r-2)(r+3)}{3 \cdot 4}, \frac{(r-3)(r+4)}{4 \cdot 5},$$

and so on until the series terminates. The coefficients of a, c, e . . . are always positive, those of b, d, f . . . always negative.

Returning now to the example in the table above, the next step is to calculate the final value in col. 7, which gives the trend ordinates that are to be obtained. This final value Y_1 is obtained from the following formula. (The numerical value in the above example is also given, as for the subsequent formulas.)

$$Y_1 = a' + 3b' + 5c' + 7d' + \cdots . \qquad 7.31150$$

The final first difference of the trend ordinates, $\Delta_1 Y_1$, which is the last entry in col. 8, is obtained from this formula (n' is the number of observations, here 10):

$$\Delta_1 Y_1 = \frac{-2 \cdot 3}{n' - 1}(b' + 5c' + 14d' + \cdots). \qquad -0.75733$$

For the final second difference, the last entry in col. 9,

$$\Delta_2 Y_1 = \frac{+3 \cdot 4 \cdot 5}{(n' - 1)(n' - 2)}(c' + 7d' + \cdots). \qquad +0.28375$$

For the final third difference, the last entry in col. 10,

$$\Delta_3 Y_1 = \frac{-4 \cdot 5 \cdot 6 \cdot 7}{(n' - 1)(n' - 2)(n' - 3)}(d' + \cdots). \qquad -0.06850$$

The positive and negative signs alternate.

The formation of the fractions in these formulas follows an obvious pattern. The coefficients of the a', b', c' . . . terms are obtained from a table, of which the first few terms are these:

	a'	b'	c'	d'	e'	f'	g'
Y_1	1	3	5	7	9	11	13
$\Delta_1 Y_1$	1	5	14	30	55	91	
$\Delta_2 Y_1$	1	7	27	77	182		
$\Delta_3 Y_1$	1	9	44	156			
$\Delta_4 Y_1$	1	11	65				
$\Delta_5 Y_1$	1	13					
$\Delta_6 Y_1$	1						

The several values for the highest degree of difference used are treated as equal to the final value for that degree of difference, as computed above; the values antecedent to the final value are not determined themselves. In the example above, the highest degree of difference used was the

third, since only a third-degree curve is to be obtained; this does not require quantities beyond d'.

In the example above, the entries above the last line in cols. 7, 8, and 9 are obtained by successively adding algebraically the appropriate differences, as follows: In col. 9, the final second difference has already been determined. Now add to it algebraically the final *third* difference, previously determined and now shown at the bottom of col. 10, and enter the result as the next to last item in col. 9. Then to this again add algebraically the final third difference. (All the third differences, it will be recalled, are here treated as equal to the final third difference, since this is the highest degree of difference used in the present example.) Continue to the point at which the second-difference column begins. Use of the adding machine and subtotaling permits all this to be done as a single continuous operation appearing on the machine tape, but the algebraic signs must be watched carefully.[1] Next, in col. 8 (first differences), the last entry has already been determined. To this now add algebraically the final *second* difference, shown in col. 9, and enter the sum as the next-to-last item in col. 8. Then to this sum add algebraically the next-to-last second difference shown in col. 9, and enter the result as the third from the last item in col. 8, and so on. In this manner, by successive additions of the appropriate second differences, all the first differences shown in col. 8 are built up. Finally, by exactly similar procedures, the trend ordinates shown in col. 7

[1] The beginning and end of the tape for col. 9 look like this (algebraic signs *preceding* the subtotals are added afterward):

+28,375
+28,375*S*
6,850–
+21,525*S*
6,850–
+14,675*S*
.
.
.
6,850–
–12,725*S*
6,850–
–19,575*S*

are built up from the final trend value (Y_1, previously obtained) and from the first differences now shown in col. 8.

If a fourth-degree curve were being fitted instead of one of third degree, the final fourth difference would have been determined previously, and the process of building up the various differences would begin with this final fourth difference. And so for curves of higher degree.

The rules for the number of significant figures which it is necessary to compute are as follows: For the quantities a, b, c . . . and a', b', c' . . . , two more figures than the original data. For Y_1, one more figure than the original data. For $\Delta_1 Y_1$, one more figure than Y_1; and, for each additional degree of difference, one additional figure. This procedure is necessary to prevent any serious cumulation of errors.

As a check on the computations, compute the sum of the ordinates of trend as thus obtained. If this sum approximates the sum of the original data previously obtained, all the processes except the initial summations are checked.

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